AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

federal register

WEDNESDAY, OCTOBER 18, 1972

WASHINGTON, D.C.

Volume 37 ■ Number 202

Pages 21981–22356

PART I

(Part II begins on page 22101)

THE NATIONAL ARCHIVES OF THE UNITED STATES ★ 1934 ★

HIGHLIGHTS OF THIS ISSUE

This listing does not affect the legal status of any document published in this issue. Detailed table of contents appears inside.

ENVIRONMENT—

- Federal Maritime Comm. extends time to 11–15–72 for comments on proposed procedures to implement Policy Act 22003
- EPA postpones to 10–27–72 hearing concerning proposals to correct deficiencies in State air quality plans 22017
- Council on Environmental Quality issues synopses of various impact statements 22013

POISON PREVENTION PACKAGING—FDA proposes exemption for products used by the elderly and handicapped; comments within 60 days 22001

CHILD PROTECTION—FDA proposes to ban certain pacifiers; comments within 60 days 22000

FLIGHTS OVER CUBA—FAA rescinds certain restrictions; effective 10–18–72 21990

JOB SAFETY—Labor Dept. updates general standards 22101

LABOR UNIONS IN FEDERAL RESERVE BANKS—

- FRS regulations on fairness in elections of bargaining representatives; effective 11–20–72 22003
- FRS policy statement declining use of strict code of conduct in union elections 21989

(Continued Inside)

Now Available

LIST OF CFR SECTIONS AFFECTED

1949–1963

This volume contains a compilation of the "List of Sections Affected" for all titles of the Code of Federal Regulations for the years 1949 through 1963. All sections of the CFR which have been expressly affected by documents published in the daily Federal Register are enumerated.

Reference to this list will enable the user to find the precise text of CFR provisions which were in force and effect on any given date during the period covered.

Price: $6.75

Compiled by Office of the Federal Register, National Archives and Records Service, General Services Administration

Order from Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

FEDERAL REGISTER

Area Code 202 Phone 962–8626

Published daily, Tuesday through Saturday (no publication on Sundays, Mondays, or on the day after an official Federal holiday), by the Office of the Federal Register, National Archives and Records Service, General Services Administration, Washington, D.C. 20408, pursuant to the authority contained in the Federal Register Act, approved July 26, 1935 (49 Stat. 500, as amended; 44 U.S.C., Ch. 15), under regulations prescribed by the Administrative Committee of the Federal Register, approved by the President (1 CFR Ch. I). Distribution is made only by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The FEDERAL REGISTER will be furnished by mail to subscribers, free of postage, for $2.50 per month or $25 per year, payable in advance. The charge for individual copies is 20 cents for each issue, or 20 cents for each group of pages as actually bound. Remit check or money order, made payable to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The regulatory material appearing herein is keyed to the CODE OF FEDERAL REGULATIONS, which is published, under 50 titles, pursuant to section 11 of the Federal Register Act, as amended (44 U.S.C. 1510). The CODE OF FEDERAL REGULATIONS is sold by the Superintendent of Documents. Prices of new books are listed in the first FEDERAL REGISTER issue of each month.

There are no restrictions on the republication of material appearing in the FEDERAL REGISTER or the CODE OF FEDERAL REGULATIONS.

HIGHLIGHTS—Continued

INSURED BANKS—FDIC, FRS, and Comptroller of the Currency issue joint call for report of condition 22017

RADIO SERVICES—
- FCC bars business service licensees from CATV systems; effective 11–20–72 21997
- FCC relaxes rule prohibiting commercial organizations from amateur radio; effective 12–1–72 21997
- FCC proposes to allow compensation for operators of amateur radio; comments by 1–3–72 22002

FOOD ADDITIVES—
- HEW sets tolerance for copper residues in drinkable water; effective 10–18–72 21991
- EPA notice of petitions from Dow Chemical and M & T Chemicals 22015

INCOME TAX—IRS rules on bonds and other evidences of indebtedness 21991

VOCATIONAL EDUCATION—HEW sets 12–16–72 as cutoff day for grant applications 22029

INVENTORY WRITE DOWNS—IRS/Price Comm. ruling against use of unusual losses in determining profit margins 21987

PESTICIDES—
- EPA sets tolerances for agricultural and livestock insecticides (2 documents); effective 10–18–72 21995
- EPA notices of tolerance petitions for hericides and insecticides (3 documents) 22015

IMPORTED SUGAR WEIGHING—USDA decides not to prohibit weighmasters affiliated with sugar firms 22005

EXTRA LONG STAPLE COTTON—USDA fixes 1973 marketing quota, acreage allotment, and referendum period; effective 10–13–72 21988

Contents

AGRICULTURAL MARKETING SERVICE

Rules and Regulations

Filberts grown in Oregon and Washington; free and restricted percentages for 1972–73 fiscal year 21988

Proposed Rule Making

Milk in the New York-New Jersey marketing area; hearing on amendments to tentative agreement 22000

Walnuts grown in California, Oregon, and Washington; expenses of Walnut Control Board and rates of assessment for 1972–73 marketing year 22000

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

Rules and Regulations

Extra long staple cotton; 1973 acreage allotments and marketing quotas 21988

Notices

Weighing of imported sugar; determination 22005

AGRICULTURE DEPARTMENT

See also Agricultural Marketing Service; Agricultural Stabilization and Conservation Service; Animal and Plant Health Inspection Service; Forest Service; Soil Conservation Service.

Notices

Organization and delegations; redelegations on temporary basis 22008

ALCOHOL, TOBACCO AND FIREARMS BUREAU

Proposed Rule Making

Distilled spirits plants; package identification; records and reports; correction 22000

ANIMAL AND PLANT HEALTH INSPECTION SERVICE

Rules and Regulations

Exotic Newcastle disease and psittacosis or ornithosis in poultry; areas released from quarantine 21989

ARMY DEPARTMENT

Notices

Army Transportation School; meeting 22005

ATOMIC ENERGY COMMISSION

Notices

Light-water-cooled nuclear power reactors; acceptance criteria for emergency core cooling systems; resumption of hearing 22012

Sacramento Municipal Utility District; consideration of issuance of facility license and opportunity for hearing 22012

CIVIL AERONAUTICS BOARD

Notices

Hearings, etc.:
- Air Traffic Conference of America 22009
- Wardair Canada, Ltd 22011

CIVIL SERVICE COMMISSION

Rules and Regulations

Interior Department; excepted service 21987

Notices

Loan and Financial Examination Officer, Farm Credit Administration; manpower shortage; listing 22012

COMMERCE DEPARTMENT

See International Commerce Bureau; Patent Office.

(*Continued on next page*)

COMPTROLLER OF THE CURRENCY

Notices

Insured banks; joint call for report of condition; cross reference 22005

DEFENSE DEPARTMENT

See Army Department.

EDUCATION OFFICE

Notices

Vocational education; closing date for receipt of applications for exemplary programs and projects; 1973 funds 22029

ENVIRONMENTAL PROTECTION AGENCY

Rules and Regulations

Tolerances for pesticide chemicals:
  2 - Chloro - 1 - (2,4 - dichlorophenyl) vinyl diethyl phosphate 21995
  O-Ethyl *S,S*-dipropylphosphorodithioate 21995

Notices

Environmental impact statements; availability of agency comments 22015
Filing of petitions regarding pesticide and food additive petitions:
  Dow Chemical Co 22015
  Dow Chemical Co. and M.&T. Chemicals, Inc 22015
  E. I. du Pont de Nemours & Co., Inc 22015
  FMC Corp 22015
  Uniroyal Chemical 22015
National ambient air quality standards; proposed State implementation plans; public hearing 22017

ENVIRONMENTAL QUALITY COUNCIL

Notices

Advisory Committee on Advanced Automotive Power Systems; meeting 22013
Environmental impact statements; public availability 22013

FEDERAL AVIATION ADMINISTRATION

Rules and Regulations

Flights over Cuba; rescission of certain requirements 21990

FEDERAL COMMUNICATIONS COMMISSION

Rules and Regulations

Amateur radio service; amateur stations used on behalf of nonamateur organizations 21997
Industrial radio services; transmission of program material to community antenna television (CATV) systems 21997
Radio broadcast services; table of assignments; Veer Broadcasting Co., Inc 21996

Proposed Rule Making

Amateur radio service; compensation of control operators and modification of logging information requirements 22002

FEDERAL DEPOSIT INSURANCE CORPORATION

Notices

Insured banks; joint call for report of condition 22017

FEDERAL MARITIME COMMISSION

Proposed Rule Making

National Environmental Policy Act of 1969; establishment of implementation procedures; extension of time for comments 22003

Notices

New York Shipping Association; man-hour/tonnage method of assessment; extension of time to file replies 22017

FEDERAL POWER COMMISSION

Notices

Hearings, etc.:
  Boston Gas Co 22017
  Columbia Gas Transmission Corp 22018

FEDERAL RAILROAD ADMINISTRATION

Notices

Petitions for hours of services exemptions:
  Manufacturers' Junction Railway Co 22011
  Sandersville Railroad Co 22011

FEDERAL RESERVE SYSTEM

Rules and Regulations

Policy on unionization and collective bargaining for Federal reserve banks; objections to election procedure 21989

Proposed Rule Making

Labor Relations Panel; elections, unionization policy, and collective bargaining for Federal Reserve banks 22003

Notices

Bank holding companies; grandfather privileges; correction 22018
Ellis Banking Corp.; acquisition of bank 22018
Insured banks; joint call for report of condition; cross reference 22018
Pacesetter Financial Corp.; formation of bank holding company 22018

FISH AND WILDLIFE SERVICE

Rules and Regulations

Wildlife refuges:
  Rachel Carson National Wildlife Refuge, Me 21999
  Wapack National Wildlife Refuge, N.H 21999

FOOD AND DRUG ADMINISTRATION

Rules and Regulations

Food additives in food for human consumption; copper 21991
Hexachlorophene as component in drug and cosmetic products for human use; correction 21991

Proposed Rule Making

Child protection packaging standards; exemption from packaging requirements for products used by elderly and handicapped 22001
Pacifiers and other similar articles; classification of certain types as banned hazardous substances 22000

FOREST SERVICE

Notices

Gila Wilderness Proposal; availability of draft environmental statment 22007

HEALTH, EDUCATION, AND WELFARE DEPARTMENT

See also Education Office; Food and Drug Administration; Health Services and Mental Health Administration.

Notices

Advisory Committee on Older Americans; Social Services subcommittee; meeting 22029

HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION

Notices

National advisory committees; meetings and cancellation 22028

HOUSING AND URBAN DEVELOPMENT DEPARTMENT

Notices

Acting Assistant Secretary for Equal Opportunity; designation 22011
Regional Administrators and Deputy Regional Administrators; designation and redelegation of authority with respect to administering oaths 22011

INTERIOR DEPARTMENT

See Fish and Wildlife Service.

INTERNAL REVENUE SERVICE

Rules and Regulations

Income tax; bonds and other evidence of indebtedness 21991
Profit margin determination; inventory write-down; Price Commission ruling 21987

INTERNATIONAL COMMERCE BUREAU

Notices

Veeco Instruments, Inc.; order imposing civil penalties and placing respondent on probation for export control violations 22008

INTERSTATE COMMERCE COMMISSION

Rules and Regulations

Quarterly reports of split or divided shipments of household goods; underestimates and overestimates 21999

Notices

Assignment of hearings 22022
Motor carriers:
  Alternate route deviation notices (2 documents) 22023
  Applications and certain other proceedings 22024
  Intrastate applications; filing 22027
  Transfer proceedings 22027

LABOR DEPARTMENT

See Occupational Safety and Health Administration.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Proposed Rule Making

Air brake systems; notice of meeting; correction 22004

NATIONAL SCIENCE FOUNDATION

Notices

Meetings:
  Advisory Panel for Genetic Biology 22019
  Advisory Panel for Oceanography 22019
  Advisory Panel for Psychobiology 22019

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Rules and Regulations

Occupational safety and health standards 22102

PATENT OFFICE

Rules and Regulations

Rules of practice in patent cases; formula and table format 21994

RENEGOTIATION BOARD

Rules and Regulations

Conduct of renegotiation; correction 21994

SECURITIES AND EXCHANGE COMMISSION

Proposed Rule Making

Customers' securities and funds; obligations of broker-dealers to maintain physical possession or control and certain reserves; extension of time for comments 22004

Notices

Hearings, etc.:
  Continental Assurance Co. and Continental Assurance Company Separate Account (B) 22019
  Continental Vending Machine Corp 22020
  Crystalography Corp 22020
  Eaton & Howard Balanced Fund 22020
  Goodway, Inc 22021
  Minute Approved Credit Plan, Inc 22021
  North American Planning Corp 22021
  Power Conversion, Inc 22021
  Southern Co. et al 22021

SOIL CONSERVATION SERVICE

Notices

Horse Range Swamp Watershed Project, South Carolina; availability of final environmental statement 22008

TRANSPORTATION DEPARTMENT

See Federal Aviation Administration; Federal Railroad Administration; National Highway Transportation Safety Administration.

TREASURY DEPARTMENT

See Alcohol, Tobacco and Firearms Bureau; Comptroller of the Currency; Internal Revenue Service.

List of CFR Parts Affected

The following numerical guide is a list of the parts of each title of the Code of Federal Regulations affected by documents published in today's issue. A cumulative list of parts affected, covering the current month to date, appears following the Notices section of each issue beginning with the second issue of the month. In the last issue of the month the cumulative list will appear at the end of the issue.

A cumulative guide is published separately at the end of each month. The guide lists the parts and sections affected by documents published since January 1, 1972, and specifies how they are affected.

5 CFR

213 21987

6 CFR

Rulings 21987

7 CFR

722 21988
982 21988
Proposed Rules:
984 22000
1002 22000

9 CFR

82 21989

12 CFR

269 21989
Proposed Rules:
291 22003

14 CFR

91 21990

17 CFR

Proposed Rules:
240 22004

21 CFR

3 21991
121 21991
Proposed Rules:
191 22000
295 22001

26 CFR

1 21991
Proposed Rules:
201 22000

29 CFR

1910 22102

32 CFR

1472 21994

37 CFR

1 21994

40 CFR

180 (2 documents) 21995

46 CFR

Proposed Rules:
547 22003

47 CFR

73 21996
91 21997
97 21997
Proposed Rules:
97 22002

49 CFR

1003 21999
Proposed Rules:
571 22004

50 CFR

28 (2 documents) 21999

Rules and Regulations

Title 5—ADMINISTRATIVE PERSONNEL

Chapter I—Civil Service Commission

PART 213—EXCEPTED SERVICE

Department of the Interior

Section 213.3112 of Schedule A is amended to show that the experience requirement for Seasonal Park Ranger, Park Aid, and Park Technician positions at the IGS–5 level has been changed from two seasons at the IGS–4 level to one season.

Effective on publication in the FEDERAL REGISTER (10–18–72), subparagraphs (1) and (2) of paragraph (f) of § 213.3112 are amended as set out below:

§ 213.3112 Department of the Interior.

* * * * *

(f) *National Park Service.* (1) Park Ranger positions (appropriate specializations) at salaries equivalent to GS–5 or GS–4 and those equivalent to grade GS–7 or GS–6 in which the duties are supervisory or are limited to a highly specialized part of the duties performed by career protective or interpretive personnel of the National Park Service. (The total number of Park Ranger and Park Technician positions at salaries equivalent to GS–7 and GS–6 excepted under this subparagraph and subparagraph (2) of this paragraph shall not exceed 200.) Employment under this subparagraph is limited to persons who meet the qualification standards for each salary level which have been agreed upon by the Commission and the Department. These standards include as a minimum the following number of previous seasons' experience in the National Park Service as a Park Ranger at a salary equivalent to the next lower grade:

(i) For IGS–7: Two seasons at IGS–6 level.

(ii) For IGS–6: Two seasons at IGS–5 level.

(iii) For IGS–5: One season at IGS–4 level.

Employment under this subparagraph shall be only for duty that is temporary, intermittent, or seasonal, and no person shall be employed by the same appointing office in the National Park Service under this subparagraph or a combination of this and any other excepting authorities in excess of 180 working days a year.

(2) Park Aid and Park Technician positions at salaries equivalent to GS–2 through GS–5 to perform technical and practical work supporting the management, conservation, interpretation, development, and use of park areas and resources; and positions at salaries equivalent to GS–7 and GS–6 in which the duties are supervisory or are limited to a highly specialized part of the duties performed by career resources management, interpretive or visitor service personnel of the National Park Service. (The total number of Park Technician and Park Ranger positions at salaries equivalent to GS–7 and GS–6 excepted under this subparagraph and subparagraph (1) of this paragraph shall not exceed 200.) Employment under this subparagraph is limited to persons who meet the qualification standards for each salary level which have been agreed upon by the Commission and the Department. These standards include as a minimum the following number of previous seasons' experience in the National Park Service as a Park Aid or Park Technician equivalent to the next lower grade:

(i) For IGS–7: Two seasons at IGS–6 level.

(ii) For IGS–6: Two seasons at IGS–5 level.

(iii) For IGS–5: One season at IGS–4 level.

(iv) For IGS–4: One season at IGS–3 level or its equivalent in experience.

(v) For IGS–3: One season at IGS–2 level or its equivalent in experience.

Employment under this subparagraph shall be only for duty that is temporary, intermittent, or seasonal, and no person shall be employed by the same appointing office in the National Park Service under this subparagraph or a combination of this and any other excepting authorities in excess of 180 working days a year.

* * * * *

(5 U.S.C. secs. 3301, 3302, E.O. 10577; 3 CFR 1954–58 Comp. p. 218)

UNITED STATES CIVIL SERVICE COMMISSION,
[SEAL] JAMES C. SPRY,
Executive Assistant to the Commissioners.

[FR Doc.72-17731 Filed 10–17–72;8:48 am]

Title 6—ECONOMIC STABILIZATION

Ruling—Internal Revenue Service, Department of the Treasury

[Price Commission Ruling 1972–261]

PROFIT MARGIN DETERMINATION; INVENTORY WRITEDOWN

Price Commission Ruling

Facts. Company A, a manufacturing firm, uses a standard cost method of accounting in preparing its financial statements. A generally writes down its inventory valuation each year upon physical count by approximately $100,000. This writedown reflects losses due to spoilage, obsolescence, and other acceptable reasons. This writedown is contemplated in the cost standards. This year, however, A proposes to write down its inventory by $400,000 due to unusual reasons, i.e., pilferage, undiscovered employee theft, and a market loss.

Issue. Is an unusual inventory writedown considered an extraordinary item or is it a general and recurring cost of business operations which may be used in determining a firm's profit margin?

Ruling. An unusual inventory writedown is not considered an extraordinary item. Such a writedown may be used in determining a firm's profit margin if it is made, as in this case, in accordance with generally accepted accounting principles consistently applied.

The profit margin of a firm is defined as, "The ratio that operating income (net sales less cost of sales and less normal and generally recurring costs of business operations, determined before nonoperating items, extraordinary items, and income taxes) bears to net sales as reported on a person's financial statement prepared in accordance with generally accepted accounting principles consistently applied." Economic Stabilization Regulations, 6 CFR 300.5 (1972). In accordance with this regulation, the expenses which may be used in calculating the profit margin must not be extraordinary and must be determined in accordance with generally accepted accounting principles, and with the practices customarily followed by the firm applied consistently.

Extraordinary items result from events or transactions which are of a character significantly different from the typical or customary business activities of the firm. They are events and transactions of material effect which would not be expected to recur frequently and which would not be considered as recurring factors in any evaluation of the ordinary operating processes of the business. Opinion No. 9 of the Accounting Principles Board, paragraph 21 (1966). A loss due to an inventory writedown, regardless of size, does not constitute an extraordinary item for A because that loss is of a character typical of the customary business activities of the firm. Opinion No. 9 supra, paragraph 22. Further, it has been A's customary practice to make an inventory adjustment at the end of each year in determining its cost of sales. The adjustment this year is therefore being made in accordance with generally accepted accounting principles consistently applied whether or not that adjustment is due to "unusual reasons."

Price Commission Ruling 1972–183, 37 F.R. 11696 (1972) which held that an inventory writedown by a firm due to extraordinary reasons is an extraordinary item which may not be used in determining the firm's current profit margin is hereby revoked.

This ruling has been approved by the General Counsel of the Price Commission.

Dated: October 13, 1972.

LEE H. HENKEL, Jr.,
Chief Counsel,
Internal Revenue Service.

Approved: October 13, 1972.

SAMUEL R. PIERCE, Jr.,
General Counsel,
Department of the Treasury.

[FR Doc.72-17728 Filed 10-17-72;8:48 am]

Title 7—AGRICULTURE

Chapter VII—Agricultural Stabilization and Conservation Service (Agricultural Adjustment), Department of Agriculture

SUBCHAPTER B—FARM MARKETING QUOTAS AND ACREAGE ALLOTMENTS

PART 722—COTTON

1973 Crop of Extra-Long Staple Cotton; Acreage Allotments and Marketing Quotas

The provisions of §§ 722.558 to 722.561 are issued pursuant to the Agricultural Adjustment Act of 1938, as amended (7 U.S.C. 1281 et seq.) (referred to as the "act") with respect to the 1973 crop of extra-long staple cotton (referred to as "ELS cotton"). The purpose of these provisions is to: (1) Proclaim a national marketing quota and national acreage allotment for the 1973 crop of ELS cotton; (2) apportion the national acreage allotment to States; and (3) fix the period for holding the national marketing quota referendum. The latest available statistics of the Federal Government have been used in making determinations under these provisions.

Notice that the Secretary was preparing to make determinations with respect to these provisions was published in the FEDERAL REGISTER on September 6, 1972 (37 F.R. 18039), in accordance with 5 U.S.C. 553. The views and recommendations received in response to such notice have been duly considered.

It is essential that these provisions be made effective as soon as possible since the proclamation of the quota and the national allotment is required to be made not later than October 15, 1972. Accordingly, it is hereby found and determined that compliance with the 30-day effective date requirement of 5 U.S.C. 553 is impracticable and contrary to the public interest, and §§ 722.558 to 722.561 shall be effective upon filing this document with the Director, Office of the Federal Register. The material previously appearing in these sections under centerhead "1972 Crop of Extra-Long Staple Cotton; Acreage Allotments and Marketing Quotas" remain in full force and effect as to the crop to which it was applicable.

§ 722.558 National marketing quota for the 1973 crop of ELS cotton.

The marketing quota for the 1973 crop of ELS cotton is hereby proclaimed to be an amount of 113,800 standard bales determined in accordance with the formula prescribed under section 347(b)(1) of the act. For the 1971 and succeeding crops of ELS cotton, it has been determined that the minimum quota of 82,481 standard bales under section 347(b)(2) of the act shall not be required to be a maximum quota under section 347(b)(3) of the act. See § 722.558 published in the FEDERAL REGISTER of October 17, 1970 (35 F.R. 16312). The marketing quota for the 1973 crop is not less than the minimum quota prescribed under section 347(b)(2) of the act. The quota is based on the following data:

(1) Estimated domestic consumption, 1973-74	[1] 105,000
(2) Estimated exports, 1973-74	[1] 17,000
(3) Adjustment to assure adequate stocks	[1] 16,800
(4) Estimated imports, 1973-74	[2] 25,000
Total	113,800

[1] Running bales.

[2] Equivalent running bales.

§ 722.559 National acreage allotment for the 1973 crop of ELS cotton.

It is hereby determined and proclaimed that a national acreage allotment shall be in effect for the crop of ELS cotton produced in the calendar year 1973. The amount of such national allotment is 117,724 acres calculated by multiplying the national quota in bales by 480 pounds (net weight of a standard bale) and dividing the result by the national average yield of 464 pounds per planted acre of ELS cotton for the 4-calendar years 1968, 1969, 1970, and 1971.

§ 722.560 Apportionment of national acreage allotment to the States.

The national acreage allotment of 117,724 acres is apportioned to the States in accordance with section 344(b) of the act as follows:

State	*State allotment (acres)*
Arizona	51,090
California	777
Florida	173
Georgia	157
New Mexico	23,921
Texas	41,606

§ 722.561 National marketing quota referendum for the 1973 crop of ELS cotton.

The national marketing quota referendum for the 1973 crop of ELS cotton shall be held during the referendum period December 4 to 8, 1972, each inclusive, by mail ballot in accordance with Part 717 of this chapter (33 F.R. 18345, 34 F.R. 12940, 36 F.R. 12730).

(Secs. 301, 343, 344, 347, 375, 52 Stat. 38, as amended; 63 Stat. 670, as amended; 63 Stat. 675, as amended; 52 Stat. 66, as amended; 7 U.S.C. 1301, 1343, 1344, 1375)

Effective date: Date of filing this document with the Director, Office of the Federal Register.

Signed at Washington, D.C., on October 12, 1972.

J. PHIL CAMPBELL,
Acting Secretary.

[FR Doc.72-17691 Filed 10-17-72;9:32 am]

Chapter IX—Agricultural Marketing Service (Marketing Agreements and Orders; Fruits, Vegetables, Nuts), Department of Agriculture

PART 982—FILBERTS GROWN IN OREGON AND WASHINGTON

Free and Restricted Percentages for 1972–73 Fiscal Year

Notice was published in the September 30, 1972, issue of the FEDERAL REGISTER (37 F.R. 20562) regarding a proposal to establish free and restricted percentages applicable to filberts grown in Oregon and Washington for the 1972–73 fiscal year beginning August 1, 1972. The percentages are based on the unanimous recommendation of the Filbert Control Board and other available information in accordance with the applicable provisions of the marketing agreement, as amended, and Order No. 982, as amended (7 CFR Part 982; 37 F.R. 588), regulating the handling of filberts grown in Oregon and Washington, effective under the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601-674).

The notice afforded interested persons opportunity to submit written data, views, or arguments with respect to the proposal. None were submitted.

The free and restricted percentages are based upon the following estimates for the 1972–73 fiscal year;

(1) Production of 10,200 tons;

(2) Total requirements for 1972 crop merchantable filberts of 5,866 tons, which is the sum of an inshell trade demand of 5,500 tons and provision for inshell handler carryover on July 31, 1973, of 750 tons, less the inshell handler carryover on August 1, 1972, of 384 tons not subject to regulation; and

(3) A total supply of merchantable filberts subject to regulation of 8,753 tons which is the estimated production of 10,200 tons, less 1,625 tons nonmerchantable production, plus 178 tons of carryin subject to regulation.

After consideration of all relevant matter presented, including that in the notice, the information and recommendations submitted by the Board, and other available information, it is found that to establish free and restricted percentages as hereinafter set forth will tend to effectuate the declared policy of the act.

Therefore, the free and restricted percentages for merchantable filberts during the 1972–73 fiscal year are established as follows:

§ 982.222 Free and restricted percentages for merchantable filberts during the 1972–73 fiscal year.

The following percentages are established for merchantable filberts for the fiscal year beginning August 1, 1972:

Free percentage	67
Restricted percentage	33

It is further found that good cause exists for not postponing the effective time of this action until 30 days after publication in the FEDERAL REGISTER (5 U.S.C. 553) in that: (1) The relevant provisions of said amended marketing agreement and this part require that free and restricted percentages designated for a particular fiscal year shall be applicable to all inshell filberts handled during such year; and (2) the current fiscal year began on August 1, 1972, and the percentages established herein will automatically apply to all such filberts beginning with such date.

(Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674)

Dated: October 12, 1972.

PAUL A. NICHOLSON,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[FR Doc.72-17768 Filed 10-17-72;8:51 am]

Title 9—ANIMALS AND ANIMAL PRODUCTS

Chapter I—Animal and Plant Health Inspection Service, Department of Agriculture

SUBCHAPTER C—INTERSTATE TRANSPORTATION OF ANIMALS (INCLUDING POULTRY) AND ANIMAL PRODUCTS

PART 82—EXOTIC NEWCASTLE DISEASE; AND PSITTACOSIS OR ORNITHOSIS IN POULTRY

Areas Released From Quarantine

Pursuant to the provisions of sections 1, 2, 3, and 4 of the Act of March 3, 1905, as amended, sections 1 and 2 of the Act of February 2, 1903, as amended, sections 4, 5, 6, and 7 of the Act of May 29, 1884, as amended, and sections 3 and 11 of the Act of July 2, 1962 (21 U.S.C. 111, 112, 113, 115, 117, 120, 123, 124, 125, 126, 134b, 134f), Part 82, Title 9, Code of Federal Regulations, is hereby amended in the following respects:

1. In § 82.3, in paragraph (a)(1) relating to the State of California, subdivision (vii) relating to San Francisco County is deleted.

2. In § 82.3, the references to Alabama and Missouri in the introductory portion of paragraph (a) and paragraphs (a)(3) relating to the State of Alabama and paragraph (a)(6) relating to the State of Missouri are deleted.

(Secs. 4–7, 23 Stat. 32, as amended; secs. 1 and 2, 32 Stat. 791–792, as amended; secs. 1–4, 33 Stat. 1264, 1265, as amended; secs. 3 and 11, 76 Stat. 130, 132; 21 U.S.C. 111–113, 115, 117, 120, 123–126, 134b, 134f; 29 F.R. 16210, as amended; 37 F.R. 6327, 6505)

Effective date. The foregoing amendments shall become effective upon issuance.

The amendments exclude a portion of Jefferson County in Alabama, a portion of San Francisco County in California, and a portion of St. Louis City County in Missouri from the areas quarantined because of exotic Newcastle disease. Therefore, the restrictions pertaining to the interstate movement of poultry, mynah, and psittacine birds, and birds of all other species under any form of confinement, and their carcasses and parts thereof, and certain other articles from quarantined areas, as contained in 9 CFR Part 82, as amended, will not apply to the excluded areas. No areas in Alabama and Missouri remain under quarantine.

The amendments relieve certain restrictions presently imposed but no longer deemed necessary to prevent the spread of exotic Newcastle disease, and must be made effective immediately to be of maximum benefit to the affected persons. It does not appear that public participation in this rule making proceeding would make additional relevant information available to the Department. Accordingly, under the administrative procedure provisions in 5 U.S.C. 553, it is found upon good cause that notice and other public procedure with respect to the amendments are impracticable and unnecessary, and good cause is found for making them effective less than 30 days after publication in the FEDERAL REGISTER.

Done at Washington, D.C., this 12th day of October 1972.

F. J. MULHERN,
Administrator, Animal and Plant Health Inspection Service.

[FR Doc.72-17721 Filed 10-17-72;8:47 am]

Title 12—BANKS AND BANKING

Chapter II—Federal Reserve System

SUBCHAPTER A—BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

PART 269—POLICY ON UNIONIZATION AND COLLECTIVE BARGAINING FOR THE FEDERAL RESERVE BANKS

Objections to Election Procedure

By notice of proposed rule making published in the FEDERAL REGISTER of November 4, 1971 (36 F.R. 21212), which revised an earlier proposal published August 6, 1971 (36 F.R. 14479), the Board of Governors proposed to amend Part 269, "Policy on Unionization and Collective Bargaining for the Federal Reserve Banks". As indicated in its proposal, the purpose of the amendment is: (1) To protect employees from any interference with their making a fair and free choice in selecting or rejecting a bargaining representative even if such interference does not constitute an unfair labor practice within the meaning of § 269.6 and (2) to authorize the Federal Reserve System Labor Relations Panel to establish an expedited procedure for processing charges of interference, to promulgate rules to guide the conduct of all parties, and to provide appropriate remedies when interference has been found to have affected the outcome of the election.

Following consideration of the comments received the Board has determined that adoption of the proposed amendments would be in the best interests of the labor organizations, the Federal Reserve Bank employees, and Federal Reserve Bank management.

To implement its decision, the Board has amended § 269.5 by adding paragraph (f) to read as follows:

§ 269.5 Elections.

* * * * *

(f)(1) If at any time prior to an election, an appreciable number of employees evidence substantial interest in representation by one or more labor organizations, whether or not a 30 percent interest has yet been shown, it shall be incumbent on the Bank, labor organizations, and all others to refrain from any conduct, action, or policy that interferes with or restrains employees from making a fair and free choice in selecting or rejecting a bargaining representative.

(2) A Bank, labor organizations, or employees are not precluded from exercise of the free speech privileges of § 269.6(c) but such exercise may properly be held to be contrary to the intent of this section even if the conduct, action, or policy in question does not constitute an unfair labor practice under § 269.6 (a) (1), (2), or (3), or § 269.6(b) (1) or (2) of this policy.

(3) The Panel may promulgate expedited procedures for prompt disposition of allegations that a violation of this section has affected the outcome of the election.

(4) The Panel may determine whether there has been a violation of this section, may render appropriate interpretations of this section, and may set forth as guidelines the circumstances the Panel believes necessary for a fair and free election by a Code of Preelection Conduct or by decision in specific cases.

(5) In the event of a proven violation of this section by a Bank, by labor organizations, or by other individuals or organizations, found sufficient to affect the outcome of an election, the Panel may take appropriate remedial action such as the setting aside of the results of an election and the ordering of a new election: *Provided, however,* That the Panel may not require a Bank to recognize a labor organization without an election unless the violation is found to be

an unfair labor practice under § 269.6 that would make a free election unlikely.

Effective date: November 20, 1972.

By order of the Board of Governors, October 5, 1972.

[SEAL] Tynan Smith,
Secretary of the Board.

[FR Doc.72-17696 Filed 10-17-72;8:47 am]

Title 14—AERONAUTICS AND SPACE

Chapter I—Federal Aviation Administration, Department of Transportation

[Docket No. 12317, Amdt. 91-105]

PART 91—GENERAL OPERATING AND FLIGHT RULES

Flights Over Cuba; Rescission of Certain Requirements

The purpose of this amendment to Part 91 of the Federal Aviation Regulations is to rescind the application of § 91.101 to flights overflying Cuba.

Federal Aviation Regulation § 91.101 was originally issued as Special Civil Air Regulations SR-437 on October 30, 1959. It was issued during a period of international tension to provide for the proper coordination and clearance of all civil aircraft (with exceptions) departing the United States for flights "to or over" Cuba.

Many civil pilots, who overfly Cuba, believe that the applicability of § 91.101 to overflights is now no longer necessary and have requested its revocation with respect to overflights. The Department of State has advised that even though it still believes that the regulation should continue to be applied to flights "to" Cuba, there is no strong objection to rescinding the regulation with respect to flights, to other countries, passing "over" Cuba. The Department of Defense has advised that it concurs in this because the DVFR or IFR flight plan filed in accordance with FAR Part 99 satisfies air defense requirements. The Immigration and Naturalization Service and the U.S. Customs Service have also advised that they have no objection.

Section 91.101 now requires that no person may operate a civil aircraft (except the operation of aircraft by a scheduled air carrier over routes authorized in operations specifications issued by the Administrator) from the United States to, or over, Cuba unless—

(1) Departure is from an international airport of entry;

(2) The pilot has filed a DVFR or IFR flight plan; and

(3) The pilot has filed a written statement containing specified information with the Office of Immigration and Naturalization Service.

Rescission of the application of § 91.101 to flights overflying Cuba will grant relief and eliminate an unnecessary inconvenience to pilots by permitting departure from any airport and by eliminating the need for filing the written statement with the Immigration and Naturalization Service.

Rescission of the application of § 91.101 to flights "over" Cuba does not in any way affect other requirements relating to flights over Cuba. Other procedures and regulations are still in effect which provide for aircraft safety, and also provide assurance that the Cuban Government will be informed before any civil aircraft of the United States overflies Cuban territory. These other procedures and regulations include the following:

1. The "International Flight Information Manual" procedures for flights entering and overflying Cuban territory.

2. Federal Aviation Regulation § 99.11, which requires that an aircraft operating in or penetrating a coastal ADIZ must file a flight plan with an appropriate aeronautical facility.

3. Paragraph 3.3.1.1.2, Chapter 3, of the "International Standards, Rules of the Air," (Annex 2 to ICAO), which provides for a flight plan to be filed for operations across international borders.

4. Federal Aviation Administration Order 7110.10A, "Flight Services," paragraphs 790 and 1180, directing controllers to use ICAO procedures and docu- other messages. ments for handling flight plans and

5. ICAO Document No. 4444-RAC/501/10, "Rules of the Air and Air Traffic Services," Part VII, Coordination, providing for flight plans submitted under Annex 2 to be forwarded to the adjacent Flight Information Region.

6. Section 91.1(b)(1) of the Federal Aviation Regulations, which requires compliance with Annex 2 to ICAO over the high seas.

The entry procedures for Cuba stated in the "International Flight Information Manual" provide for a notification, by the overflying operator, by means of a cablegram addressed to AEROCIVIL, Habana, not less than 48 hours in advance of the anticipated time of departure.

These procedures provide for specific information (such as name, nationality, and official address of the operator, name of pilot in command, air corridor to be used under the flight plan, and date of the overflight) to be included in the cablegram. Under these procedures, this information is sent to AEROCIVIL, and the reply from AEROCIVIL insures that the notification has been received, and communicates its decision in the matter. Any aircraft which is authorized to make an overflight transmits its flight plan to the Habana air traffic control center not less than 1 hour before it enters the Flight Information Region assigned to the Republic of Cuba. Finally, these procedures provide for overflying aircraft to furnish the position reports prescribed by the areonautical authority for the area of its jurisdiction, and to make use of any services and facilities for aid to navigation that have been established or that are required under regional agreements of the ICAO or for reasons of safety.

It should be clearly noted that rescinding the applicability of § 91.101 to aircraft overflying Cuba does not eliminate the requirement of filing a flight plan for such flights. As stated above, § 99.11(a) of the Federal Aviation Regulations provides that "no person may operate an aircraft in or penetrating a coastal or domestic ADIZ unless he has filed a flight plan with an appropriate aeronautical facility." Any flight from the United States to Cuba that penetrates an ADIZ involves the required filing of a flight plan. Also, as stated above, paragraph 3.3.1.1.2, Chapter 3, of the "International Standards, Rules of the Air" (Annex 2 to ICAO), provides for a flight plan to be filed when operating across international borders. The United States, being a member of ICAO, complies with this provision.

The mere filing of a flight plan does not insure that the Cuban Government is informed that a United States civil aircraft will overfly Cuban territory. However, FAA Order 7110.10A "Flight Services," paragraphs 790 and 1180, directs a controller to use ICAO procedures for handling flight plans and flight plan information. Therefore, pursuant to ICAO Document No. 4444-RAC/501/10 "Rules of the Air and Air Traffic Services," Part VII, "Coordination" and Part VII, "Air Traffic Messages," controllers forward flight plans to adjacent Flight Information Regions. This procedure does assure that the Cuban Government will receive necessary prior information relating to overflights.

The safe operation of U.S. civil aircraft overflying Cuba is further achieved through § 91.1(b) of the Federal Aviation Regulations. This regulation requires, with certain exceptions, that each person operating a civil aircraft of U.S. registry outside of the United States, when over high seas, shall comply with Annex 2 (Rules of the Air) to the Convention on International Civil Aviation, and, when within a foreign country, comply with the regulations relating to the flight and maneuver of aircraft there in force.

Based upon the above discussion, and for the reasons stated, the FAA believes that the applicability of § 91.101 to flights overflying Cuba should be rescinded.

Since this amendment is minor in nature, and relieves the public of a burden that was imposed in response to an international situation that no longer requires that burden, it is found that notice and public procedure hereon would serve no useful purpose and are not necessary.

In consideration of the foregoing, Part 91 of the Federal Aviation Regulations is amended, effective October 18, 1972, as hereinafter set forth.

The introductory sentence of § 91.101 is amended to read as follows:

§ 91.101 Operations to Cuba.

No person may operate a civil aircraft from the United States to Cuba unless—

* * * * *

(Secs. 307(a), 313(a), Federal Aviation Act of 1958, 49 U.S.C. 1348(a), 1354(a); and sec.

6(c), Department of Transportation Act, 49 U.S.C. 1655(c))

Issued in Washington, D.C., on October 11, 1972.

J. H. Shaffer,
Administrator.

[FR Doc.72-17716 Filed 10-17-72;8:48 am]

Title 21—FOOD AND DRUGS

Chapter I—Food and Drug Administration, Department of Health, Education, and Welfare

SUBCHAPTER A—GENERAL

PART 3—STATEMENTS OF GENERAL POLICY OR INTERPRETATION

Hexachlorophene as a Component in Drug and Cosmetic Products for Human Use; Correction

In F.R. Doc. 72-16442 appearing at page 20160 in the Federal Register of Wednesday, September 27, 1972, the reference to "§ 135.9(d)" in the last line of § 3.91(c)(4)(ii) should read "§ 130.9(d)".

Dated: October 12, 1972.

Robert C. Brandenburg,
Acting Associate Commissioner for Compliance.

[FR Doc.72-17713 Filed 10-17-72;8:46 am]

SUBCHAPTER B—FOOD AND FOOD PRODUCTS

PART 121—FOOD ADDITIVES

Subpart D—Food Additives Permitted in Food for Human Consumption

Copper

A notice was published by the Environmental Protection Agency in the Federal Register of February 15, 1972 (37 F.R. 3366), proposing establishment of a food-additive tolerance (21 CFR Part 121) of 1 part per million for residues of copper in potable water. Such residues would result from the use of the algicides or herbicides copper sulfate pentahydrate and basic copper carbonate (malachite) to control aquatic plants in reservoirs, lakes, ponds, irrigation ditches, and other potential sources of potable water. No requests for referral to an advisory committee were received. However, "copper sulfate pentahydrate" was changed to "copper sulfate" in response to a comment that the degree of hydration of the copper sulfate is not important. It is concluded that the amended proposal should be adopted.

The Reorganization Plan No. 3 of 1970, published in the Federal Register of October 6, 1970 (35 F.R. 15623), transferred (effective December 2, 1970) to the Administrator of the Environmental Protection Agency the functions vested in the Secretary of Health, Education, and Welfare for establishing tolerances for pesticide chemicals under sections 406, 408, and 409 of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 346, 346a, and 348).

Therefore, pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 409(d), 72 Stat. 1787; 21 U.S.C. 348(d)), the authority transferred to the Administrator of the Environmental Protection Agency (35 F.R. 15623), and the authority delegated by the Administrator to the Deputy Assistant Administrator for Pesticides Program (36 F.R. 9038), Part 121 is amended by adding the following new section to Supart D:

§ 121.1241 Copper.

A tolerance of 1 part per million is established in potable water for residues of copper resulting from the use of the algicides or herbicides copper sulfate and basic copper carbonate (malachite) to control aquatic plants in reservoirs, lakes, ponds, irrigation ditches, and other potential sources of potable water.

Any person who will be adversely affected by the foregoing order may at any time within 30 days after its date of publication in the Federal Register file with the Hearing Clerk, Environmental Protection Agency, Room 3125, South Agriculture Building, 12th Street and Independence Avenue SW., Washington, D.C. 20460, written objections thereto in quintuplicate. Objections shall show wherein the person filing will be adversely affected by the order and specify with particularity the provisions of the order deemed objectionable and the grounds for the objections. If a hearing is requested, the objections must state the issues for the hearing. A hearing will be granted if the objections are supported by grounds legally sufficient to justify the relief sought. Objections may be accompanied by a memorandum or brief in support thereof.

Effective date. This order shall become effective on its date of publication in the Federal Register (10-18-72).

(Sec. 409(d), 72 Stat. 1787; 21 U.S.C. 348(d))

Dated: October 6, 1972.

Edwin L. Johnson,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72-17705 Filed 10-17-72;8:46 am]

Title 26—INTERNAL REVENUE

Chapter I—Internal Revenue Service, Department of the Treasury

SUBCHAPTER A—INCOME TAX

[T.D. 7213]

PART 1—INCOME TAX; TAXABLE YEARS BEGINNING AFTER DECEMBER 31, 1953

Bonds and Other Evidences of Indebtedness

On July 22, 1971, a notice of proposed rule making with respect to the amendments of the Income Tax Regulations (26 CFR Part 1) under section 1232 to conform the regulations to changes made by section 413 of the Tax Reform Act of 1969 (83 Stat. 609) was published in the Federal Register (36. F.R. 13605). On December 28, 1971, Treasury Decision 7154, published in the Federal Register on December 28, 1971 (36 F.R. 24995), adopted with modifications certain of the proposed changes and reserved certain of the items. After consideration of all relevant matters as were presented by interested persons regarding the rules proposed, the amendment of the regulations with respect to such proposed rules reserved in Treasury Decision 7154, and certain other of such relevant matters, are hereby adopted, subject to the changes set forth below:

Paragraph 1. Section 1.163-4 is amended by revising paragraph (a) to read as set forth below.

Par. 2. Section 1.1001-1 is amended by adding a new paragraph (g) immediately after paragraph (f) to read as set forth below.

Par. 3. Section 1.1012-1 is amended by revising paragraph (f) to read as set forth below.

Par. 4. Paragraph (b) of § 1.1232-3, as set forth in paragraph 15 to the notice of proposed rule making, is amended by revising subparagraphs (1)(iv) and (2)(iii)(*b*) and (*c*) to read as set forth below.

Par. 5. Paragraph (a)(2)(iii) and Example (4) of paragraph (d) of § 1.1232-3A, as set forth in paragraph 16 to the notice of proposed rule making, are adopted without change.

Par. 6. Paragraph (e) of § 1.1232-3A is amended by revising subparagraph (5)(ii), by redesignating subparagraph (5)(ii) as (5)(iii), and by adding a new subparagraph (7), to read as set forth below.

(Sec. 7805, Internal Revenue Code of 1954, 68A Stat. 917; 26 U.S.C. 7805)

[seal] Johnnie M. Walters,
Commissioner of Internal Revenue.

Approved: October 7, 1972.

Frederic W. Hickman,
Assistant Secretary of the Treasury.

§ 1.163-4 Deduction for original issue discount on certain obligations issued after May 27, 1969.

(a) *In general.* (1) If an obligation is issued by a corporation with original issue discount, the amount of such discount is deductible as interest and shall be prorated or amortized over the life of the obligation. For purposes of this section the term "obligation" shall have the same meaning as in § 1.1232-1 (without regard to whether the obligation is a capital asset in the hands of the holder) and the term "original issue discount" shall have the same meaning as in section 1232(b)(1) (without regard to the one-fourth of 1 percent limitation in the second sentence thereof). Thus, in general, the amount of original issue discount equals the excess of the amount payable at maturity over the issue price of the bond (as defined in paragraph (b)(2) of § 1.1232-3), regardless of whether that amount is less than one-fourth of 1 percent of the redemption price at maturity multiplied by the number of complete years to maturity. For the rule as to whether there is original issue discount in the case of an obligation issued in an exchange for property other than money, and the amount therof, see paragraph (b)(2)(iii) of § 1.1232-3. In any case in which original issue discount is carried over from one corporation to another corporation under section 381(c)(9) or from an obligation exchanged to an obligation received in any exchange under paragraph (b)(1)(iv) of § 1.1232-3, such discount shall be carried over for purposes of this section. The amount of original issue discount carried over in an exchange of obligations under the preceding sentence shall be prorated or amortized over the life of the obligation issued in such exchange. For computation of issue price and the amount of original issue discount in the case of serial obligations, see paragraph (b)(2)(iv) of § 1.1232-3.

* * * * *

§ 1.1001-1 Computation of gain or loss.

* * * * *

(g) *Certain exchanges involving original issue discount.* In the case of certain obligations or investment units exchanged for property, involving original issue discount under the provisions of section 1232(b), the amount realized will be determined in accordance with the rules of paragraph (b)(2)(iii)(*b*) of § 1.1232-3.

§ 1.1012-1 Basis of property.

* * * * *

(f) *Special rules.* For special rules for determining the basis for gain or loss in the case of certain vessels acquired through the Maritime Commission (or its successors) or pursuant to an agreement with the Secretary of Commerce, see sections 510, 511, and 607 of the Merchant Marine Act, 1936, as amended (46 U.S.C. 1160, 1161) and Parts 2 and 3 of this Chapter. For special rules for determining the unadjusted basis of property recovered in respect of war losses, see section 1336. For special rules with respect to taxable years beginning before January 1, 1964, for determining the basis for gain or loss in the case of a disposition of a share of stock acquired pursuant to the timely exercise of a restricted stock option where the option price was between 85 percent and 95 percent of the fair market value of the stock at the time the option was granted, see paragraph (b) of § 1.421-5. See section 423(c)(1) or 424(c)(1), whichever is applicable, for special rules with respect to taxable years ending after December 31, 1963, for determining the basis for gain or loss in the case of the disposition of a share of stock acquired pursuant to the timely exercise of a stock option described in such sections. See section 422(c)(1) for special rules with respect to taxable years ending after December 31, 1963, for determining the basis for gain or loss in the case of an exercise of a qualified stock option. For special rules with respect to certain exchanges creating original issue discount under the provisions of section 1232(b), see paragraph (b)(2)(iii)(*b*) of § 1.1232-3.

§ 1.1232-3 Gain upon sale or exchange of obligations issued at a discount.

* * * * *

(b) *Definitions*—(1) *Original issue discount.* * * *

(iv) *Carryover of original issue discount.* If in pursuance of a plan of reorganization an obligation is received in an exchange for another obligation, and if gain or loss is not recognized in whole or in part on such exchange of obligations by reason, for example, of section 354 or 356, then the obligation received shall be considered to have the same original issue discount as the obligation surrendered reduced by the amount of gain (if any) recognized as ordinary income upon such exchange of obligations, and by the amount of original issue discount with respect to the obligation surrendered which was included as interest income under the ratable inclusion rules of sections 1232(a)(3) and 1.1232-3A. If inclusion as interest of the ratable monthly portion of original issue discount is required under section 1232(a)(3) with respect to the obligation received, see paragraph (a)(2)(iii) of § 1.1232-3A for computation of the ratable monthly portion of original issue discount. For special rules in connection with certain exchanges of U.S. obligations, see section 1037.

(2) *Issue price defined.* * * *

(iii) *Issuance for property after May 27, 1969*—(*a*) *In general.* Except as provided in (*b*) of this subdivision, if an obligation or an investment unit is issued for property other than money, the issue price of such obligation shall be the stated redemption price at maturity and, therefore, no original issue discount is created as a result of the exchange. However, in such case, there may be an amount treated as interest under section 483. In the case of certain exchanges of obligations of the United States for other such obligations, see section 1037 for the determination of the amount of original issue discount on the obligation acquired in the exchange. For carryover of original issue discount in the case of certain exchanges of obligations, see subparagraph (1)(iv) of this paragraph.

(*b*) *Exceptions for original issue discount.* If an obligation or investment unit is issued for property in an exchange which is not pursuant to a plan of reorganization referred to in (*d*) of this subdivision, and if—

(*1*) The obligation, investment unit, or an element of the investment unit is part of an issue a portion of which is traded on an established securities market, or

(*2*) The property for which such obligation or investment unit is issued is stock or securities which are traded on an established securities market,

then the issue price of the obligation or investment unit shall be the fair market value of the property for which such obligation or investment unit is issued, as determined under (*c*) of this subdivision. Such issue price shall control for purposes of determining the amount realized by the person exchanging the property for the obligation or unit issued and the bases of the property acquired by the holder and issuer.

(*3*) An obligation which is not traded on an established securities market and which is not part of an issue or investment unit a portion of which is so traded shall not be treated as property decribed in (*1*) of this (*b*) even though the obligation is convertible into property so traded. For purposes of this (*b*), an obligation, investment unit, or element of an investment unit shall be treated as traded on an established securities market if it is so traded on or within 10 "trading" days after the date it is issued. "Trading" days shall mean those days on which an established securities market is open. For purposes of this subdivision (iii), the term "established securities market" shall have the same meaning as in paragraph (d)(4) of § 1.453-3 (relating to limitations on installment method for purchaser evidences of indebtedness payable on demand or readily tradable).

(*c*) *Determination of fair market value in cases to which* (*b*) *of this subdivision applies.* In general, for purposes of (*b*) of this subdivision, the fair market value of property for which an obligation or investment unit is issued shall be deemed to be the same as the fair market value of such obligation or investment unit, determined by reference to the fair market value of that portion of the issue, of which such obligation or unit is a part, which is traded on an established securities market. The fair market value of such obligation or unit shall be determined as of the first date after the date of issue (within the meaning of section 1232(b)(3)) that such obligation or unit is traded on an established securities market. If, however, the obligation or investment unit is not part of an issue a portion of which is traded on an established securities market, but the property for which the obligation or investment unit is issued is stock or securities which are traded on an established securities market, the fair market value of such property shall be the fair market value of such stock or securities on the date such obligation or unit is issued for such property. The fair market value of property for purposes of this (*c*) shall be determined as provided in § 20.2031-2 of this chapter (Estate Tax Regulations) but without applying the blockage and other special rules contained in paragraph (e) thereof.

(*d*) *Not in reorganization.* An exchange which is not pursuant to a reorganization referred to in this subdivision (*d*) is an exchange in which the obligation or investment unit is not issued pursuant to a plan of reorganization within the meaning of section 368(a)(1) or pursuant to an insolvency reorganizaation within the meaning of section 371, 373, or 374. Thus, for example, no original issue discount is created on an obligation issued in a recapitalization within the meaning of section 368(a)(1)(E). Similarly, no original issue discount is created on an obligation issued in an exchange, pursuant to a plan of reorganization, to which section 361 applies regardless of the income tax consequences to any person who pursuant to such plan is the ultimate recipient of the obligation. The application of section 351 shall not preclude the creation of original issue discount. For carryover of original issue discount in the case of an exchange of obligations pursuant to a plan of reorganization, see subparagraph (1)(iv) of this paragraph.

(*e*) *Effective date.* Determinations with respect to obligations issued on or before May 27, 1969, or pursuant to a written commitment which was binding on that date and at all times thereafter, shall be made without regard to this subdivision (iii).

* * * * *

§ 1.1232–3A Inclusion as interest of original issue discount on certain obligations issued after May 27, 1969.

(a) *Ratable inclusion as interest.* * * *

(2) *Ratable monthly portion of original issue discount.* * * *

(iii) *Ratable monthly portion upon carryover to new obligation.* In any case in which there is a carryover of original issue discount under paragraph (b)(1)(iv) of § 1.1232–3 from an obligation exchanged to an obligation received in such exchange, the ratable monthly portion of original issue discount in respect of the obligation received shall be computed by dividing the amount of original issue discount carried over by the sum of the number of complete months (plus any fractional part of a month) beginning on the date of the exchange and ending the day before the stated maturity date of the obligation received.

* * * * *

(4) *Examples.* * * *

Example (*4*). On January 1, 1968, D, a calendar year taxpayer, purchases at original issue, for cash of $8,000, P Corporation's 20-year, 6 percent bond which has a stated redemption price of $10,000 and which will mature on January 1, 1988. The original issue discount with respect to such bond is $2,000. However, the ratable inclusion rules of section 1232(a)(3) do not apply to D, since the bond was issued by P before May 28, 1969. On January 1, 1973, pursuant to a plan of reorganization as defined in section 368(a)(1)(E), and in which no gain or loss is recognized by D under section 354, D's 20-year bond is exchanged for a 10-year, 6 percent bond which also has a stated redemption price of $10,000 but will mature on January 1, 1983. Under paragraph (b)(1)(iv) of § 1.1232–3, the $2,000 of original issue discount is carried over to the new 10-year bond received in such exchange. Since the new bond is an obligation issued after May 27, 1969, D is required to begin ratable inclusion of the $2,000 of discount as interest in his gross income for 1973. The ratable monthly portion of original issue discount, as determined under section 1232(a)(3) to be included as interest in gross income is computed as follows:

Amount of original issue discount carried over	$2,000
Divide by: Number of complete months beginning on January 1, 1973, and ending on December 31, 1982	120 months
Ratable monthly portion	$16.67

§ 1.1232–3A Inclusion as interest of original issue discount on certain obligations issued after May 27, 1969.

* * * * *

(e) *Application of section 1232 to certain deposits in financial institutions and similar arrangements.* * * *

(5) *Time deposit open account arrangements.* * * *

(ii) *Obligations redeemed before maturity.* In the event of a partial redemption of a time deposit open account before maturity, the following rules, in addition to subparagraph (2) of this paragraph, shall apply:

(*a*) If, pursuant to the terms of the withdrawal, the amount received by the depositor is determined with reference to the principal amount of a specific deposit and interest earned from the date of such deposit, then such terms shall control for the purpose of determining which deposit was withdrawn.

(*b*) If (*a*) of this subdivision (ii) does not apply, then the withdrawal shall be deemed to be of specific deposits together with interest earned from the date of such deposits, on a first-in, first-out basis.

(iii) *Examples.* The provisions of this subparagraph may be illustrated by the following examples:

Example (*1*). (i) F is a cash method taxpayer who uses the calendar year as his taxable year. On December 1, 1970, F enters into a 5-year deposit open account arrangement with M Savings and Loan Corp. The terms of the arrangement provide that F will deposit $100 each month for a period of 5 years, and that interest will be compounded semiannually (on June 1 and December 1) at 6 percent, but will be paid only at maturity. Thus, assuming F makes deposits of $100 on the first of each month beginning with December 1, 1970, the account will have a stated redemption price of $6,998.20 at maturity on December 1, 1975. Since, however, section 1232 applies only to deposits made after December 31, 1970 (see paragraph (d) of § 1.1232–1), the $34.39 of compound interest to be earned on the first deposit of $100 over the term of the arrangement will not be subject to the ratable inclusion rules of section 1232(a)(3). F must include such $34.39 of interest in his gross income on December 1, 1975, the date it is paid.

(ii) For 1971, F must include $44.19 of original issue discount as interest in gross income, to be computed as follows:

(1) Date of $100 deposit	(2) Months to maturity	(3) Redemption price at maturity	(4) Original issue discount (col. 3—$100)	(5) Ratable monthly portion (col. 4÷col. 2)	(6) Months on deposit in 1971	(7) 1971 original issue discount (col. 5×col. 6)
1-1-71	59	$133.73	$33.73	$0.5717	12	$6.86
2-1-71	58	133.07	33.07	.5702	11	6.27
3-1-71	57	132.42	32.42	.5688	10	5.69
4-1-71	56	131.77	31.77	.5673	9	5.11
5-1-71	55	131.12	31.12	.5658	8	4.53
6-1-71	54	130.48	30.48	.5644	7	3.95
7-1-71	53	129.84	29.84	.5630	6	3.38
8-1-71	52	129.20	29.20	.5615	5	2.81
9-1-71	51	128.56	28.56	.5600	4	2.24
10-1-71	50	127.93	27.93	.5586	3	1.68
11-1-71	49	127.30	27.30	.5571	2	1.11
12-1-71	48	126.68	26.68	.5558	1	0.56
Total original issue discount to be included as interest in F's gross income for 1971						44.19

Example (*2*). (i) G is a cash method taxpayer who uses the calendar year as his taxable year. On February 1, 1971, G enters into a 4-year deposit open account arrangement with T Bank, a corporation. The terms of the deposit arrangement provide that G may deposit any amount from time to time in multiples of $50 for a period of 4 years. The terms also provide that G may not redeem any amount until February 1, 1975, except in an emergency as defined in, and subject to the qualifications provided by, Regulation Q of the Board of Governors of the Federal Reserve System. See 12 CFR § 217.4(d). Interest will be compounded semiannually (on February 1 and August 1) at 6 percent, providing there is no redemption prior to February 1, 1975. However, if there is a redemption prior to such date, interest will be compounded semiannually at 5½ percent.

(ii) The schedule of deposits made by G pursuant to the arrangement, and computation of ratable monthly portion for each deposit, is set forth in the table below:

(1) Date of deposit	(2) Months to maturity	(3) Amount of deposit	(4) Redemption price at maturity	(5) Original issue discount (col. 4—col. 3)	(6) Ratable monthly portion (col. 5÷col. 2)
2-1-71	48	100	$126.68	$26.68	$0.5558
6-1-71	44	200	248.42	48.42	1.1005
12-1-71	38	500	602.95	102.95	2.7092
2-1-72	36	800	955.24	155.24	4.3122
3-1-72	35	800	950.56	150.56	4.3017
7-1-72	31	600	699.00	99.00	3.1933
8-1-72	30	250	289.82	39.82	1.3275

(iii) With respect to amounts on deposit pursuant to the arrangement, the amounts of original issue discount G must include as interest in his gross income for 1971 and 1972 are computed in the table below:

(1) Date of deposit	(2) Ratable monthly portion	(3) Months on deposit in 1971	(4) 1971 original issue discount (Col. 2 × Col. 3)	(5) Months on deposit in 1972	(6) 1972 original issue discount (Col. 2 × Col. 5)
2-1-71	$0.5558	11	$6.11	12	$6.67
6-1-71	1.1005	7	7.70	12	13.21
12-1-71	2.7092	1	2.71	12	32.51
2-1-72	4.3122			11	47.43
3-1-72	4.3017			10	43.02
7-1-72	3.1935			6	19.16
8-1-72	1.3273			5	6.64
Total original issue discount includible as interest in gross income for taxable year			16.52		168.64

(7) *Contingent interest arrangements other than those described in subparagraph* (6)—(i) *In general.* If under the terms of a deposit arrangement, contingent interest may be earned and credited to a depositor's account, but is neither actually or constructively received before a fixed maturity date nor treated under subparagraph (6)(i) of this paragraph as creating a separate obligation, then the redemption price shall include the amount which would be credited to such account assuming the issuer, during the term of such account, credits contingent interest at the greater of the rate—

(*a*) Last credited on a similar account, or

(*b*) Equal to the average rate credited for the preceding 5 calendar years on a similar account.

(ii) *Adjustments for additional interest.* The rate taken into account under this subparagraph in computing the redemption price shall be treated as the guaranteed minimum rate for purposes of applying subparagraph (6) of this paragraph in the event the rate at which contingent interest is actually credited to the depositor's account exceeds such rate previously taken into account. If for any period the actual rate at which contingent interest is credited to the account exceeds by more than 1 percentage point the rate for the previous period taken into account under this subparagraph in computing the redemption price, a new computation shall be made to determine the ratable monthly portion of original issue discount to be included as interest in the gross income of the depositor over the remaining term of the account. For purposes of such computation, the date that interest is first so credited to the account shall be treated as the issue date, the adjusted basis of the account on such date shall be the issue price, and the redemption price shall equal the amount actually on deposit in the account on such date plus the amount which would be credited to such account assuming the issuer, during the remaining term of such account, continues to credit contingent interest at the new rate.

(iii) *Adjustment for reduced interest.* If for any period the actual rate of interest at which contingent interest is credited to the depositor's account is less than the rate for the previous period taken into account under this subparagraph in computing the redemption price, the difference between the amount of interest which would have been credited to the account at the rate for such previous period and the amount actually credited shall be allowed as a deduction against the amount of original issue discount with respect to such account required to be included in the gross income of the depositor. If an account is redeemed for a price less than the adjusted basis of the account, the depositor shall be allowed as a deduction, in computing adjusted gross income, the amount of the original issue discount he included in gross income but did not receive.

[FR Doc.72-17604 Filed 10-17-72;8:51 am]

Title 32—NATIONAL DEFENSE

Chapter XIV—Renegotiation Board

SUBCHAPTER B—RENEGOTIATION BOARD REGULATIONS UNDER THE 1951 ACT

PART 1472—CONDUCT OF RENEGOTIATION

Miscellaneous Amendments to Chapter

Correction

In F.R. Doc. 72-16816 appearing at page 20690 of the issue for Tuesday, October 3, 1972, in § 1472.3(j)(4), the third complete sentence, reading, "In the event of the issuance of an order, as the case may be, will be followed", should be deleted. In addition, the phrase "the co will be entitled, upon request,", which appears in the fourth sentence, should be deleted.

Title 37—PATENTS, TRADEMARKS, AND COPYRIGHTS

Chapter I—Patent Office, Department of Commerce

PART 1—RULES OF PRACTICE IN PATENT CASES

Formula and Table Format

On February 2, 1972, notice of proposed rule making regarding the amendment of §§ 1.52 and 1.75 and the addition of a new § 1.58 of Title 37, Code of Federal Regulations, dealing with Formula and Table Format, was published in the FEDERAL REGISTER (37 F.R. 2520). Interested persons were given until April 30, 1972, to submit written comments, suggestions, or objections. Full and careful consideration was given to all written comments received. In view of these comments the proposed rule language has been revised. The revised rules do not now require that the formulas and tables be presented on separate bristolboard sheets but simply require them to be presented in the specification in a form suitable for photographic reproduction.

These rule changes are intended to facilitate the microfilming of application papers and the printing of patents which contain formulas and tables in the text.

Under the new rules the text of printed patents would continue to be typeset, with formulas and tables being photographically reproduced and appearing at their proper location in the text. This procedure should result in a reduction of printing errors and costs.

This rule change also makes more liberal the size of paper permissible in patent applications.

In consideration of the comments received and pursuant to the authority contained in section 6 of the Act of July 19, 1952 (66 Stat. 793; 35 U.S.C. 6), Part 1 of Title 37, Code of Federal Regulations, is hereby amended as follows:

1. Section 1.52 is revised to read as follows:

§ 1.52 Language, paper, writing, margins.

(a) The specification and oath or declaration must be in the English language. All papers which are to become a part of the permanent records of the Patent Office must be legibly written or printed in permanent ink or its equivalent in quality. All of the application papers must be presented in a form having sufficient clarity and contrast between the paper and the writing or printing thereon to permit the production of readily legible copies in any number by use of photographic, electrostatic, photo-offset, and microfilming processes. If the papers are not of the required quality, substitute typewritten or printed papers of suitable quality may be required.

(b) The application papers (specification, including claims, oath, or declaration, papers as provided for in §§ 1.42, 1.43, 1.47, etc.) and also papers subsequently filed, must be plainly written on but one side of the paper. The size of all sheets of paper should be 8 to 8½ by 10½ to 13 inches (20.3 to 21.6 cm. by 26.6 to 33.0 cm.). A margin of 1½ inches (3.8 cm.) must be reserved on the left-hand side and on the top of each page of the specification, including claims. The lines must not be crowded too closely together; typewritten lines should be double spaced. The pages of the specification, including claims, should be numbered consecutively, starting with 1, the numbers being placed in the center of the bottom margins.

(c) Any interlineation, erasure, or cancellation or other alteration of the application papers as filed must have been made before the application was signed and sworn to or declaration made, and should be dated and initialed or signed by the applicant in a marginal note or footnote on the same sheet of paper to indicate such fact. No such alterations are permissible after execution of the application papers. (See § 1.56.)

2. A new § 1.58 is added to read as follows:

§ 1.58 Chemical and mathematical formulas and tables.

(a) The specification, including the claims, may contain chemical and mathematical formulas, but shall not contain drawings or flow diagrams. The description portion of the specification may contain tables; claims may contain tables only if necessary to conform to 35 U.S.C. 112.

(b) All tables and chemical and mathematical formulas in the specification, including claims, and amendments thereto, must be on pure white durable paper, the surface of which is calendered and smooth, in order to permit use as camera copy when printing any patent which may issue. A good grade of bond paper is acceptable; watermarks should not be prominent. India ink or its equivalent, or solid black typewriter ribbon must be used to secure perfectly black solid lines.

(c) To facilitate camera copying when printing, the width of formulas and tables as presented should be limited normally to 5 inches (12.7 cm.) so that it may appear as a single column in the printed patent. If it is not possible to limit the width of a formula or table to 5 inches (12.7 cm.), it is permissible to present the formula or table with a maximum width of 10¾ inches (27.3 cm.) and to place it sideways on the sheet, in which case the formula or table will appear printed across both columns of the page in the printed patent. Typewritten characters used in such formulas and tables must be from a block (nonscript) type font or lettering style having capital letters which are at least 0.085 inch (2.2 mm.) high (elite type). Hand lettering must be neat, clean, and have a minimum character height of 0.085 inch (2.2 mm.). A space at least ¼ inch (6.4 mm.) high should be provided between the formulas and tables and the text. Tables should have the lines and columns of data closely spaced to conserve space, consistent with high degree of legibility.

§ 1.75 [Amended]

3. Section 1.75 is amended by adding at the end of paragraph (d)(1) the expression "(See § 1.58(a).)".

Effective date. These amendments shall become effective on January 1, 1973, and will apply to applications filed after that date.

Richard A. Wahl,
Acting Commissioner of Patents.

Approved: October 12, 1972.

Richard O. Simpson,
Acting Assistant Secretary for Science and Technology.

[FR Doc.72-17727 Filed 10-17-72;8:48 am]

Title 40—PROTECTION OF ENVIRONMENT

Chapter I—Environmental Protection Agency

SUBCHAPTER E—PESTICIDES PROGRAMS

PART 180—TOLERANCES AND EXEMPTIONS FROM TOLERANCES FOR PESTICIDE CHEMICALS IN OR ON RAW AGRICULTURAL COMMODITIES

2-Chloro-1-(2,4-Dichlorophenyl) Vinyl Diethyl Phosphate

A notice (PP 1E1082) was published by the Environmental Protection Agency in the Federal Register of August 19, 1972 (37 F.R. 16812), proposing establishment of tolerances for residues of the insecticide 2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate in the raw agricultural commodities fat of cattle and sheep at 0.15 part per million to control ectoparasites on foreign animals (spray or dip application). A minimum 3-day preslaughter interval is usually observed after application. No comments or requests for referral to an advisory committee were received.

It is concluded that the proposal should be adopted.

Therefore, pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 408(e), 68 Stat. 514; 21 U.S.C. 346a(e)), the authority transferred to the Administrator of the Environmental Protection Agency (35 F.R. 15623), and the authority delegated by the Administrator to the Deputy Assistant Administrator for Pesticide Programs (36 F.R. 9038), Part 180 is amended as follows:

1. In § 180.3(e)(5), by alphabetically inserting in the list of cholinesterase-inhibiting pesticides a new item, as follows:

§ 180.3 Tolerances for related pesticide chemicals.

* * * * *

(e) * * *

(5) * * *

2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate.

* * * * *

2. In Subpart C, by adding a new section as follows:

§ 180.322 2-Chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate; tolerances for residues.

A tolerance of 0.15 part per million is established for residues of the insecticide 2-chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate from dermal application to animals (minimum preslaughter interval 3 days) in or on the raw agricultural commodity fat of cattle and sheep.

Any person who will be adversely affected by the foregoing order may at any time within 30 days after its date of publication in the Federal Register file with the Hearing Clerk, Environmental Protection Agency, Room 3125, South Agriculture Building, 12th Street and Independence Avenue SW., Washington, D.C. 20460, written objections thereto in quintuplicate. Objections shall show wherein the person filing will be adversely affected by the order and specify with particularity the provisions of the order deemed objectionable and the grounds for the objections. If a hearing is requested, the objections must state the issues for the hearing. A hearing will be granted if the objections are supported by grounds legally sufficient to justify the relief sought. Objections may be accompanied by a memorandum or brief in support thereof.

Effective date. This order shall become effective on its date of publication in the Federal Register (10-18-72).

(Sec. 408(e), 68 Stat. 514; 21 U.S.C. 346a(e).)

Dated: October 6, 1972.

Edwin L. Johnson,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72-17707 Filed 10-17-72;8:46 a.m.]

PART 180—TOLERANCES AND EXEMPTIONS FROM TOLERANCES FOR PESTICIDE CHEMICALS IN OR ON RAW AGRICULTURAL COMMODITIES

O-Ethyl S,S-Dipropylphosphorodithioate

A petition (PP 2F1250) was filed by Mobil Chemical Co., Industrial Chemicals Division, Post Office Box 677, Richmond, VA 23208, in accordance with provisions of the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 346a), proposing establishment of tolerances (40 CFR Part 180) for negligible residues of the insecticide *O*-ethyl *S,S*-dipropylphosphorodithioate in or on the raw agricultural commodities brussels sprouts and cabbage at 0.02 part per million.

Subsequently, the petitioner amended the petition by withdrawing the proposed tolerance on brussels sprouts.

Based on consideration given the data submitted in the petition and other relevant material, it is concluded that:

1. The insecticide is useful for the purpose for which the tolerance is being established.

2. There is no reasonable expectation of residues in eggs, meat, milk, or poultry, and § 180.6(a)(3) applies.

3. The tolerance established by this order will protect the public health.

Therefore, pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 408(d)(2), 68 Stat. 512; 21 U.S.C. 346a(d)(2)), the authority transferred to the Administrator of the Environmental Protection Agency (35 F.R. 15623), and the authority delegated by the Administrator to the Deputy Assistant Administrator for Pesticides Programs (36 F.R. 9038), § 180.262 is revised to read as follows to establish the new tolerance:

§ 180.262 *O*-Ethyl *S,S*-dipropylphosphorodithioate; tolerances for residues.

Tolerances are established for negligible residues of the insecticide *O*-ethyl *S,S*-dipropylphosphorodithioate in or on the raw agricultural commodities bananas, cabbage, corn grain, corn fodder and forage, fresh corn including sweet corn (kernels plus cob with husk removed), peanuts, peanut hay, pineapples, pineapple fodder and forage, soybeans, soybean forage and hay, sugarcane, sugarcane fodder and forage, and sweet potatoes at 0.02 part per million.

Any person who will be adversely affected by the foregoing order may at any time within 30 days after its date of publication in the FEDERAL REGISTER file with the Hearing Clerk, Environmental Protection Agency, Room 3125, South Agriculture Building, 12th Street and Independence Avenue SW., Washington, D.C. 20460, written objections thereto in quintuplicate. Objections shall show wherein the person filing will be adversely affected by the order and specify with particularity the provisions of the order deemed objectionable and the grounds for the objections. If a hearing is requested, the objections must state the issues for the hearing. A hearing will be granted if the objections are supported by grounds legally sufficient to justify the relief sought. Objections may be accompanied by a memorandum or brief in support thereof.

Effective date. This order shall become effective on its date of publication in the FEDERAL REGISTER (10-18-72).

(Sec. 408(d)(2), 68 Stat. 512; 21 U.S.C. 346a (d)(2))

Dated: October 6, 1972.

EDWIN L. JOHNSON,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72-17706 Filed 10-17-72;8:46 am]

Title 47—TELECOMMUNICATION

Chapter I—Federal Communications Commission

[Docket No. 19074; FCC 72-882]

PART 73—RADIO BROADCAST SERVICES

FM Broadcast Stations in Certain Cities in Kentucky, Tennessee, and Virginia

Memorandum opinion and order. In the matter of amendment of § 73.202 (b), Table of assignments, FM Broadcast Stations (Greenville, Ky.; Burnside, Greensburg, and Jamestown, Ky.; Oak Ridge and Jamestown, Tenn.; Pineville, Barbourville, and Middlesboro, Ky.; and Big Stone Gap, Va.), Docket No. 19074.

1. The Commission here considers the Petition for Reconsideration filed by Veer Broadcasting Co., Inc., from that portion of the report and order, adopted January 12, 1972, denying the proposal for allocating Channel 276A to Greensburg, population 1,990, the seat and largest community of Green County, population 10,350, to be used 1 mile or more northeast of the city. 32 FCC 2d 937, 938-940.

2. In denying the assignment to Greensburg, we relied primarily on the fact that the petitioners Messrs. Milby and Price had not commented in the proceeding thus "evidencing a present lack of interest" (32 FCC 2d at 939), while Welby Hoover, doing business as Lake Cumberland Broadcasters (Lake Cumberland, the licensee of Station WJRS-FM, Jamestown, Ky., had opposed the assignment (primarily on the basis of considerations of reimbursement). As to reimbursement, it is "well settled" law that operating stations are entitled to reasonable payment; see paragraph 15 of the notice; paragraph 11 of the Second Report and Order in Docket No. 18476, 26 FCC 2d 162, 166 (1970); paragraph 14 of the report and order in this docket (32 FCC 2d at 942-3). In this respect, Lake Cumberland's claim for loss of listeners and good will, money and time expended for programing, and jingles to promote its current frequency are not reimbursable costs under the cited cases. We also rejected Lake Cumberland's other contentions—that service from its station to Greensburg (a distance of 30 miles) especially public service and public affairs programings and that WJRS-FM earns some revenue from Greensburg—were not reasons for rejecting an allocation to Greensburg under section 307(b) of the Act. While we stated that there was no presumption because of such failure, we speculated that petitioners' interest had waned because of the financial burden of building AM Station WGRK and the need to reimburse Station WJRS-FM to change from Channel 276A to 285A.

3. In fact, it appears that Messrs. Milby and Price had lost interest in radio service at Greensburg. They had relinquished their interest in Veer Broadcasting Co., Inc. (Veer Broadcasting) to Robert L. Towers and James M. Hay. Veer Broadcasting was granted AM Station WGRK at Greensburg. Veer Broadcasting then filed a petition for reconsideration in this proceeding.

4. We deferred action on the petition for reconsideration pending an agreement between Veer Broadcasting and Lake Cumberland as to reimbursement. The parties have now negotiated such an agreement, although Lake Cumberland will recover only from the successful applicant for Channel 276A. Accordingly, we deem it in the public interest to allocate a channel to Greensburg and change the assignment at Jamestown. Authority for adoption of the amendment proposed herein is contained in sections 4(i), 303 (g) and (r), and 307(b) of the Communications Act of 1934, as amended.

5. In accordance with the foregoing: *It is ordered,* That, effective November 20, 1972, the FM Table of Assignments (§ 73.202(b) of the rules) is amended, with respect to the cities listed below, as follows:

City	*Channel No.*
Greensburg, Kentucky	276A
Jamestown, Kentucky	285A

6. *It is further ordered,* That, effective November 20, 1972, and pursuant to section 316(a) of the Communications Act of 1934, as amended, the outstanding license held by Lake Cumberland Broadcasters for Station WJRS-FM, Jamestown, Ky., is modified to specify operation on Channel 285A in lieu of Channel 276A subject to the following conditions:

(a) The licensee shall inform the Commission in writing by no later than November 20, 1972, of its acceptance of this modification.

(b) The licensee shall submit to the Commission by December 11, 1972, all necessary information complying with the applicable technical rules for modification of authorization to cover the operation of Station WJRS-FM on Channel 285A at Jamestown, Ky.

(c) The licensee may continue to operate on Channel 276A under its outstanding authorization until it is ready to operate on the new frequency or until 45 days after a construction permit has been granted for Channel 276A at Greensburg, Ky. Within 30 days of commencing operation on Channel 285A, the licensee shall submit measurement data of the sort normally required in an application for an FM broadcast station license.

(d) Lake Cumberland Broadcasters shall not commence operation on Channel 285A until the Commission specifically authorizes it to do so.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083; 47 U.S.C. 154, 303, 307)

Adopted: October 5, 1972.

Released: October 11, 1972.

FEDERAL COMMUNICATIONS
COMMISSION,[1]
[SEAL] BEN F. WAPLE,
Secretary.

[FR Doc.72-17738 Filed 10-17-72;8:50 am]

[Docket No. 17824; FCC 72-894]

PART 91—INDUSTRIAL RADIO SERVICES

Transmission of Program Material to Community Antenna Television (CATV) Systems

Report and order. In the matter of amendment of § 91.552 of the Commission's rules to provide that stations licensed in the Business Radio Service may not be used for the transmission of program material to community antenna television (CATV) systems, Docket No. 17824.

1. When the Commission established the Community Antenna Relay Service (CAR) in 1965, it also adopted rules which provide that authorizations would no longer be granted in the Business Radio Service for microwave point-to-point radio stations for relaying television, standard, or FM broadcast signals to community antenna television (CATV) systems. "First Report and Order" in Docket 15586, 1 FCC 2d 897; and § 91.552(e). The basic reason, for the Commission's decision, among others, was that the regulatory problems involved in CATV operations were markedly different from those involved in the Business Radio Service and, therefore, private CATV microwave relay systems should be accommodated and regulated in a separate radio service.

2. The instant proposal, which would prohibit microwave systems licensed in the Business Radio Service from carrying program material from any source to CATV systems, is merely a further step in the process and would implement the Commission's earlier basic decision. The comments filed[1] did not disagree with this basic proposition. However, when the notice was issued, the Community Antenna Relay Service rules did not provide for the transmission of other than off-the-air broadcast signals by CAR licensed private systems, and the comments urged delay of finalization of the proposed rules until the CAR rules were also appropriately amended so as to avoid a hiatus. The CAR rules have since been amended and now permit transmission of locally originated programs and, therefore, action may be taken in this proceeding.

3. Accordingly, the proposed amendments will be adopted. However, as suggested by the comments of H & B Communications, CATV microwave relay systems currently authorized in the Business Radio Service will be permitted to carry off-the-air broadcast signals as well as program material obtained from other sources until they are required to discontinue their operations pursuant to § 91.552(e) of the Commission's rules. An amendment to § 91.552 (e) adopted in Docket No. 18916 (FCC 70-1272, released December 10, 1970), provides that previously "grandfathered" CATV microwave systems may be continued to be authorized in the Business Radio Service on a year-to-year basis until February 1, 1976.

4. *Accordingly, it is ordered,* Pursuant to authority contained in sections 4(i) and 303 of the Communications Act of 1934, as amended, That effective November 20, 1972, § 91.552(e) is amended as set forth below.

5. *It is further ordered,* That this proceeding is terminated.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; 47 U.S.C. 154, 303)

Adopted: October 5, 1972.

Released: October 11, 1972.

FEDERAL COMMUNICATIONS
COMMISSION,[2]
[SEAL] BEN F. WAPLE,
Secretary.

In § 91.552 of the Commission's rules, paragraph (e) is amended to read:

§ 91.552 Availability and use of service.

* * * * *

(e) Stations licensed in the Business Radio Service may not be used for the transmission of program material to cable television systems: *Provided, however,* That existing systems authorized to transmit programs for distribution on a cable television system prior to November 22, 1965, may continue to do so until not later than February 1, 1976, or until an earlier date if the Commission determines that the frequencies in the 12,200-12,700 MHz band are needed for operational fixed stations in the Safety and Special Radio Services. Expansion of these existing systems in the Business Radio Service is not contemplated and it is further provided that:

(1) No additional stations or frequencies will be authorized in this service;

(2) Replacement of equipment may be authorized only if the new equipment can be modified easily for operation in the 12,700-12,950 MHz band;

(3) The license term of all authorizations will not exceed 1 year.

* * * * *

[FR Doc.72-17739 Filed 10-17-72;8:50 am]

[Docket No. 19245; FCC 72-895]

PART 97—AMATEUR RADIO SERVICE

Amateur Stations Used on Behalf of Nonamateur Organizations

Report and Order. In the matter of inquiring into the extent to which amateur stations should be used on behalf of nonamateur organizations, Docket No. 19245, RM-1687.

1. On April 28, 1971, the Commission issued a notice of inquiry in the above-entitled matter. The notice which was published in the FEDERAL REGISTER on May 8, 1971 (36 F.R. 8611) requested that comments be filed by interested parties by July 1, 1971. Subsequently, the time for filing comments was extended to August 31, 1971. Seventy-five comments were filed by both individuals, amateur organizations, and other organizations which have in the past used the facilities of amateur radio stations.

2. The notice of inquiry was the proximate result of § 97.39 which prohibits certain organizations from both obtaining an amateur station license or having an amateur operator use his station on behalf of those organizations. One of the effects of this rule is to prohibit amateur operators from using their stations on behalf of such parties as the Eye Bank, American Red Cross, and the March of Dimes as well as commercial businesses.

3. Our notice requested comments regarding whether any restriction on the use of amateur radio stations by nonamateur organizations is needed. We also requested comments on what those restrictions should be. The notice further related to the fact that unlimited operation on behalf of organizations (third party communications) could lead to the creation of large numbers of new networks which would create additional unwarranted interference on the amateur bands.

4. The comments received in the docket suggested many solutions to the problem of which organizations, if any, should be allowed to use amateur radio facilities. The comments covered the full range from no third party communications to any communications that individual amateurs wish to carry. Most of the comments advocated a position between those two positions. Three comments suggested that amateur radio be used on behalf of nonamateur organizations but only when normal communications are unavailable. Many other comments suggested that third party communications be allowed for charitable nonprofit organizations but only during emergencies. A majority of the comments agreed that it is not a sound practice to allow commercial organizations to use amateur radio stations but there was no concensus as to what other organization should have use of amateur stations.

---

[1] Commissioners Robert E. Lee and Reid absent.

[1] Comments were filed by: New Channels Corp.; National Trans-Video, Inc.; Cosmos Cablevision Corp.; Association of Maximum Service Telecasters, Inc.; Cox Cablevision Association, Inc.; H & B Communications Corp.; Times Herald Printing Co.; All-Channel Television Society; The Jerrold Corp.; National Cable Television Association, Inc.

[2] Commissioner Johnson concurring in the result; Commissioner Reid absent.

5. The Commission believes that the best solution lies between the extremes of prohibiting entirely third party communication and permitting unlimited third party operations. To prohibit entirely third party traffic would tend to stifle one of the basic purposes of the Amateur Radio Service which is to provide a voluntary noncommercial radio service. But to allow all third party communications would tend to cause increased congestion in the Amateur bands. A basic principle permeating our rules and the international radio regulations is that amateur radio shall not be used for any pecuniary interest to any party or for commercial communications. The international rules specifically provide that amateur radiocommunications must be of a technical nature or remarks of a personal character for which, by reason of their unimportance, recourse to a public telecommunications service is not justified. There can be no legitimate reason for an amateur station to carry message traffic of a commercial nature. Radiocommunications, the sole purpose of which is to facilitate regular business or commercial activities, do not enchance the intended purpose of the Amateur Service and should not be allowed except for an emergency communication as defined in our rules.

6. Several comments were received which suggested that the thrust of the Commission's notice of inquiry was to censor the Amateur Radio Service. These comments suggested that any categorization of groups, some of which could use amateur radio facilities and others who could not, would be in violation of section 326 of the Communications Act of 1934 which prohibits censorship of radio communications. It has been established, however, that eligibility restrictions and reasonable rules limiting communications to those consistent with the purpose of the radio service involved are within the scope of the Commission's authority. See, Lafayette Radio Electronics Corp. v. United States, 345 F. 2d 278 (2d Cir. 1965). Moreover, it is not only permissible but an affirmative duty of this Commission to classify radio stations and to regulate the nature of the radiocommunication service that is to be rendered by stations in that class. See section 303 (a) and (b). Our rules adopted today regarding commerical third party traffic merely regulate generally the nature of the radio communication service which may be rendered by amateur stations.

7. The rules adopted today will delete the phrase "nor for its use" which is contained in § 97.39. The result of this action will make § 97.39 a rule concerned only with who or what organizations may obtain a license. The amended § 97.39 will not be directed to permissible communication or to the use of an amateur station.

8. We are adding a new section, § 97.114, which will both prohibit commercial third party traffic and clarify the permissible international third party traffic. As to the provisions of paragraph (a) concerning international third party traffic, these rules simply incorporate the already existing international rules. As such they make no change in permissible communications and they are therefore considered to be of an editorial nature. Paragraph (c) of § 97.114 prohibits corporations, companies, associations, and other organizations engaged in commercial activities from using amateur radio facilities. It will not prohibit the use of the Amateur Radio Service on behalf of organizations such as the Eye Bank and the American Red Cross except for traffic which relates to the regular business affairs of those organizations. Paragraph (b) will prohibit amateur control operators or station licensees from receiving any compensation including a salary or reimbursement for noncollect telephone calls for operating an amateur station for transmitting or delivering third party traffic. This provision explicitly sets forth the fact that both domestic and international amateur traffic must not be handled with a pecuniary interest in mind.

9. To prevent unnecessary confusion as to what is meant by third party traffic, we are adopting a definition of that term and are making editorial changes in § 97.79(d).

10. The provisions of §§ 97.114(b) and 97.112 will clearly prohibit the American Radio Relay League's longstanding practice of providing compensation to the control operators of station W1AW. As a consequence, we are today issuing a notice of proposed rule making in a separate proceeding which would allow in certain instances involving club stations the compensation of control operators. We are also herein granting a waiver of the necessary rules to the licensee of station W1AW to allow the station to continue to operate pending the final action on our notice of proposed rule making. Any other club station providing similar services as W1AW may apply for a similar waiver. Such requests will be handled on a case by case basis.

11. The American Radio Relay League and several other individuals filed comments which suggested that the Commission adopt a rule specifically prohibiting communications for any purpose or activity which is contrary to Federal, State, or local law. We find that this suggestion as it applies to any radio communications including third party traffic, has substantial merit. Therefore, with certain editorial changes, we are adopting their proposal as § 97.116.

12. Authority for the rule changes adopted herein is contained in sections 4(i) and 303 of the Communications Act of 1934, as amended.

13. The Commission finds that further public notice in regard to the subject matter of this report and order is unnecessary. Notice of the general subject matter and of the issues involved was previously given and extensive comments from interested parties have been received and given careful consideration. No public interest would be served by further notice and public participation in this matter.

14. *It is ordered*, Effective December 1, 1972, that Part 97 of the Commission's rules is amended as set forth below.

15. *It is further ordered*, That a waiver of §§ 97.112 and 97.114(b) is granted to the licensee of amateur station W1AW.

16. *It is further ordered*, That RM-1687 is denied to the extent that it is inconsistent with the rules adopted in this report and order and that this proceeding is terminated.

(Secs. 4, 303, 48 Stat., as amended, 1066, 1082; 47 U.S.C. 154, 303)

Adopted: October 5, 1972.

Released: October 11, 1972.

FEDERAL COMMUNICATIONS
COMMISSION,
[SEAL] BEN F. WAPLE,
Secretary.

Part 97 of the Commission's rules is amended as follows:

1. Paragraphs (w) and (x) are added to § 97.3, to read as follows:

§ 97.3 Definitions.

* * * * *

(w) *Third-party traffic.* Amateur radio communication by or under the supervision of the control operator at an amateur radio station to another amateur radio station on behalf of anyone other than the control operator.

(x) *Emergency communication.* Any amateur radio communication directly relating to the immediate safety of life of individuals or the immediate protection of property.

2. Section 97.39 is amended to read as follows:

§ 97.39 Eligibility of corporations or organizations to hold station license.

An amateur station license will not be issued to a school, company, corporation, association, or other organization, except that in the case of a bona fide amateur radio organization or society, a station license may be issued to a licensed amateur operator, other than the holder of a Novice Class license, as trustee for such society.

3. Section 97.79(d) is amended to read as follows:

§ 97.79 Control operator requirements.

* * * * *

(d) The licensee of an amateur radio station may permit any third party to participate in amateur radio communication from his station, provided that a control operator is present and continuously monitors and supervises the radiocommunication to insure compliance with the rules.

4. Section 97.114 is added to read as as follows:

§ 97.114 Third party traffic.

The transmission or delivery of the following amateur radiocommunication is prohibited:

(a) International third party traffic except with countries which have assented thereto;

(b) Third party traffic involving material compensation, either tangible or intangible, direct or indirect, to a third party, a station licensee, a control operator, or any other person.

(c) Except for an emergency communication as defined in this part, third party traffic consisting of business communications on behalf of any party. For the purpose of this section business communication shall mean any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party.

4. Section 97.116 is added as follows:

§ 97.116 Amateur radiocommunication for unlawful purposes prohibited.

The transmission of radiocommunication or messages by an amateur radio station for any purpose, or in connection with any activity, which is contrary to Federal, State, or local law is prohibited.

[FR Doc.72-17736 Filed 10-17-72;8:50 am]

Title 49—TRANSPORTATION

Chapter X—Interstate Commerce Commission

SUBCHAPTER A—GENERAL RULES AND REGULATIONS

PART 1003—LIST OF FORMS

Quarterly Reports of Split or Divided Shipments of Household Goods and Underestimates and Overestimates

Order. At a general session of the Interstate Commerce Commission, held at its office in Washington, D.C., on the 12th day of October 1972.

Prescription of quarterly reports of (1) underestimates and overestimates (Form BOp No. 101) and (2) split or divided shipments of household goods (Form BOp No. 106).[1]

It is ordered, That form BOC No. 101 (49 CFR 1003.1), be, and it is hereby, vacated and revoked.

It is further ordered, That forms BOp No. 101 and BOp No. 106 (49 CFR 1003.1), entitled respectively, Quarterly Report of Underestimates and Overestimates and Quarterly Report of Split or Divided Shipments of Household Goods, which are attached hereto and incorporated in this order, be, and they are hereby, prescribed and approved.

It is further ordered, That § 1003.1 of Title 49 of the Code of Federal Regulations be, and it is hereby, amended by the revocation of subhead BOC 101, and the addition of subheads BOp 101 and BOp 106 as follow:

BOp 101. Quarterly Report of Underestimates Overestimates to be used by motor carriers of household goods.

BOp 106. Quarterly Report of Split or Divided Shipments of Household Goods.

(Sec. 222(h), 49 U.S.C. 322(h))

It is ordered, That this order shall become effective on November 20, 1972.

And it is further ordered, That notice of this order shall be given to the general public by depositing a copy thereof in the Office of the Secretary of the Commission, Washington, D.C., and by filing a copy with the Director, Office of the Federal Register.

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17761 Filed 10-17-72;8:50 am]

---

[1] Forms BOp No. 101 and BOp No. 106 filed as part of the original document.

Title 50—WILDLIFE AND FISHERIES

Chapter I—Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Department of the Interior

PART 28—PUBLIC ACCESS, USE, AND RECREATION

Rachel Carson National Wildlife Refuge, Maine

The following special regulation is issued and is effective on date of publication in the FEDERAL REGISTER (10-18-72).

§ 28.28 Special regulations: Recreation; for the individual wildlife refuge areas.

MAINE

RACHEL CARSON NATIONAL WILDLIFE REFUGE

Entrance into Rachel Carson National Wildlife Refuge is permitted the public for the purpose of nature study, bird watching, hiking, photography, sightseeing, picnicking, snowshoeing, cross-country skiing, and clamming.

All terrain vehicles, trail bikes, air cushion vehicles, snowmobiles, camping, littering, horses, and unleashed pets are prohibited on refuge lands. Cutting or defacing trees and signs, removal of live vegetation, and fires are also prohibited.

The above regulations are a supplement to those set forth in Title 50, Code of Federal Regulations, § 28.28. Clamming is subject to the applicable provisions of State laws and regulations and local ordinances.

RICHARD E. GRIFFITH,
Regional Director, Bureau of Sport Fisheries and Wildlife.

OCTOBER 4, 1972.

[FR Doc.72-17702 Filed 10-17-72;8:45 am]

PART 28—PUBLIC ACCESS, USE, AND RECREATION

Wapack National Wildlife Refuge, N.H.

The following special regulation is issued and is effective on date of publication in the FEDERAL REGISTER (10-18-72).

§ 28.28 Special regulations: Recreation; for the individual wildlife refuge areas.

NEW HAMPSHIRE

WAPACK NATIONAL WILDLIFE REFUGE

Entrance onto designated trails of Wapack National Wildlife Refuge is permitted for the purposes of sightseeing, nature study, bird watching, hiking, photography, snowshoeing, and cross-country skiing. The refuge is open for these activities on a year-round basis.

All terrain vehicles, trail bikes, air cushion vehicles, snowmobiles, littering, horses, and unleashed pets are prohibited on refuge lands. Cutting or defacing of trees and signs, removal of any live vegetation, are also prohibited.

The above regulations are a supplement to those set forth in Title 50, Code of Federal Regulations, § 28.28.

RICHARD E. GRIFFITH,
Regional Director, Bureau of Sport Fisheries and Wildlife.

OCTOBER 4, 1972.

[FR Doc.72-17703 Filed 10-17-72;8:45 am]

Proposed Rule Making

DEPARTMENT OF THE TREASURY

Bureau of Alcohol, Tobacco and Firearms

[26 CFR Part 201]

DISTILLED SPIRITS PLANTS

Package Identification, Records and Reports

Correction

In F.R. Doc. 72-16877, appearing at page 20838, in the issue of Wednesday, October 4, 1972, in § 201.628(a)(5), after the twelfth line reading "identification for packages or serial num-", insert, "bers for cases. In addition, separate files".

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

[7 CFR Part 984]

WALNUTS GROWN IN CALIFORNIA, OREGON, AND WASHINGTON

Proposed Expenses of Walnut Control Board and Rates of Assessment for 1972–73 Marketing Year

Notice is hereby given of a proposal regarding expenses of the Walnut Control Board and rates of assessment for the 1972–73 marketing year. The year began August 1, 1972. The proposal is pursuant to §§ 984.68 and 984.69 of the marketing agreement, as amended, and Order No. 984, as amended (7 CFR Part 984). The amended marketing agreement and order regulate the handling of walnuts grown in California, Oregon, and Washington, and are effective under the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674). The proposal is based on a recommendation of the Board.

The proposed expenses total $175,000; the proposed assessment rates are 10 cents per pound for inshell walnuts and 25 cents per pound for shelled walnuts. These rates will be applied to all merchantable walnuts handled or declared for handling during the 1972–73 marketing year. Such rates of assessment are expected to provide sufficient funds to meet the estimated expenses of the Board.

Consideration will be given to any written data, views, or arguments pertaining to the proposal which are received by the Hearing Clerk, U.S. Department of Agriculture, Room 112, Administration Building, Washington, D.C. 20250, not later than October 27, 1972. All written submissions made pursuant to this notice should be in quadruplicate and will be made available for public inspection at the office of the Hearing Clerk during regular business hours (7 CFR 1.27(b)).

The proposal is as follows:

§ 984.324 Expenses of the Walnut Control Board and rates of assessment for the 1972–73 marketing year.

(a) *Expenses.* Expenses in the amount of $175,000 are reasonable and likely to be incurred by the Walnut Control Board during the marketing year beginning August 1, 1972, for its maintenance and functioning, and for such purposes as the Secretary may, pursuant to the provisions of this part, determine to be appropriate.

(b) *Rates of assessment.* The rates of assessment for said marketing year, payable by each handler in accordance with § 984.69, are fixed at 10 cents per pound for merchantable inshell walnuts and 25 cents per pound for merchantable shelled walnuts.

Dated: October 12, 1972.

Paul A. Nicholson,
Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[FR Doc.72-17720 Filed 10-17-72;8:47 am]

[7 CFR Part 1002]

[Docket No. AO-71-A65]

MILK IN NEW YORK-NEW JERSEY MARKETING AREA

Hearing on Proposed Amendments to Tentative Marketing Agreement and Order

Notice is hereby given of a public hearing to be held in the Conference Room of the Market Administrator's office, 205 East 42d Street, New York, NY, beginning at 9:30 a.m., on November 16, 1972, with respect to proposed amendments to the tentative marketing agreement and to the order, regulating the handling of milk in the New York-New Jersey marketing area.

The hearing is called pursuant to the provisions of the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601 et seq.), and the applicable rules of practice and procedure governing the formulation of marketing agreements and marketing orders (7 CFR Part 900).

The purpose of the hearing is to receive evidence with respect to the economic and marketing conditions which relate to the proposed amendments, hereinafter set forth, and any appropriate modifications thereof, to the tentative marketing agreement and to the order.

The proposed amendments, set forth below, have not received the approval of the Secretary of Agriculture.

Proposed by Northeast Dairy Cooperative Federation, Inc., and Dairylea Cooperative, Inc.

Proposal No. 1. In § 1002.55 (Transportation Credit), revise the terms "ten cents" to read "fifteen cents".

Proposal No. 2. In § 1002.80 (Time and Method of Payment), delete the second, third, and fourth sentences (negotiable tank truck service charge up to 10 cents per hundredweight) and amend § 1002.82 by revising the heading and adding a new paragraph (c) to that section as follows:

§ 1002.82 Volume and location differential.

* * * * *

(c) For pool milk received in a pool or partial pool unit, a stop-charge of not more than one dollar and fifty cents ($1.50) for each stop of a tank truck at a producer's farm may be deducted in making payments to producers pursuant to § 1002.80 to cover the cost of transferring the producer's milk from his farm bulk tank to the tank truck for transport of the milk to the market outlet.

Proposed by the Dairy Division, Consumer and Marketing Service

Proposal No. 3. Make such changes as may be necessary to make the entire marketing agreement and the order conform with any amendments thereto that may result from this hearing.

Copies of this notice of hearing and the order may be procured from the Market Administrator, 205 East 42d Street, New York, NY 10017, or from the Hearing Clerk, Room 112-A, Administration Building, U.S. Department of Agriculture, Washington, D.C. 20250 or may be there inspected.

Signed at Washington, D.C., on October 12, 1972.

John C. Blum,
Deputy Administrator, Regulatory Programs.

[FR Doc.72-17719 Filed 10-17-72;8:47 am]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration

[21 CFR Part 191]

CERTAIN PACIFIERS AND OTHER SIMILAR ARTICLES

Proposal To Classify as Banned Hazardous Substances

The Federal Hazardous Substances Act, as amended by the Child Protection and Toy Safety Act of 1969 (Public Law 91-113; 83 Stat. 187-90), provides that any toy or other article intended for use by children may be classified as a hazardous substance upon a determination that it presents a mechanical hazard. Such a determination may be made by a regulation promulgated in accordance with 5 U.S.C. 553. The nature of a mechanical hazard is set forth in section 2(s) of the Federal Hazardous Substances Act. A determination that any toy or other article intended for use by children presents such a hazard classifies it as a banned hazardous substance.

In 1971, a 2-month-old child died of asphyxiation from a pacifier with a rigid, unhinged handle, and a small-diameter guard. The rigid handle served to wedge the pacifier in the throat after the small guard allowed the entire pacifier to be taken into the mouth. Reports have also been received by the Commissioner of Food and Drugs of incidents where prompt first aid or hospital emergency room treatment resulted in the removal of pacifier components which had lodged in infants' throats. Consumers have reported that many pacifiers can be easily disassembled by infants, resulting in the availability of small components which may be put into the mouth and accidentally aspirated or ingested. Complaints have also been received concerning plastic pacifiers that break into sharp pieces, pacifiers that rupture and exude jelly fillings, and hard candy pacifiers.

The Commissioner has determined that some of these articles and their components have mechanical hazards associated with their design and manufacture which present an unreasonable risk of personal injury or illness from ingestion, aspiration, or laceration, and that such articles should be banned from interstate commerce.

Therefore, pursuant to provisions of the Federal Hazardous Substances Act (secs. 2(f)(1)(D), (s), 3(e)(1); 74 Stat. 372, 374, 375, as amended 83 Stat. 187-89; 15 U.S.C. 1261, 1262) and under authority delegated to him (21 CFR 2.120), the Commissioner proposes to amend Part 191 by adding a new subparagraph to § 191.9a(a) and by adding a new § 191.18, as follows:

§ 191.9a Banned toys and other banned articles intended for use by children.

(a) * * *

(8) Any pacifier or other similar article that is not designed and constructed in accordance with the following:

(i) The guard (or shield) shall not be less than 43 millimeters (1¾ inches) in diameter if the guard is made of a flexible material or shall not be less than 38 millimeters (1½ inches) if the guard is made of an inflexible material (if the guard is not round it shall have the above dimensions in each of two principal perpendicular planes); and

(ii) The handle or ring shall be hinged or collapsible; and

(iii) The article shall not bear or contain any object or substance that is nonsterile or any object that may become accessible for aspiration or ingestion during normal use or when subjected to reasonably foreseeable damage or abuse; and

(iv) The article shall be of a one-piece construction or shall be otherwise designed and constructed so that it remains intact when tested by the method described in § 191.18, or if the article does not remain intact when tested in accordance with § 191.18 its nipple is permanently attached to the guard and any components which separate when tested in accordance with § 191.18 have dimensions no smaller than those required for guards in subdivision (i) of this subparagraph; and

(v) The article shall not consist, in whole or in part, of any food; and

(vi) The article shall be otherwise designed and constructed so as to prevent the possibility of injury or illness by ingestion, aspiration, or laceration from the article itself or from any of its components.

§ 191.18 Method for determining the durability of pacifiers.

The test to determine whether a pacifier is designed and constructed so as to remain intact under normal use and reasonably foreseeable damage or abuse is as follows:

(a) Hold the nipple of the pacifier in a stationary position. Using a spring scale (Chatillon No. 719-40 MRP or equivalent) attached to the handle of the pacifier, subject the pacifier to a straight pull of 10 pounds.

(b) Hold the guard (or shield) of the pacifier in a stationary position. Using the spring scale attached to the handle of the pacifier, subject the pacifier to a pull of 10 pounds applied at right angles to a line drawn through the length of the nipple.

(c) Repeat the procedure described in paragraph (b) of this section with the spring scale attached to the nipple of the pacifier.

(d) Submerge the pacifier in boiling water for 10 minutes and allow the pacifier to remain in the water until the water has cooled to 100° F. Then repeat the tests described in paragraphs (a), (b), and (c) of this section.

(e) Repeat the entire procedure described in paragraph (d) nine times.

Interested persons may, within 60 days after publication hereof in the FEDERAL REGISTER, file with the Hearing Clerk, Department of Health, Education, and Welfare, Room 6-88, 5600 Fishers Lane, Rockville, Md. 20852, written comments (preferably in quintuplicate) regarding this proposal. Comments may be accompanied by a memorandum or brief in support thereof. Received comments may be seen in the above office during working hours, Monday through Friday.

Dated: October 12, 1972.

ROBERT C. BRANDENBURG,
Acting Associate Commissioner for Compliance.

[FR Doc.72-17714 Filed 10-17-72;8:48 am]

[21 CFR Part 295]

CHILD PROTECTION PACKAGING STANDARDS

Proposed Exemption From Packaging Requirements for Products Used by the Elderly and the Handicapped

Section 4 of the Poison Prevention Packaging Act of 1970 provides that any household substance subject to a special packaging standard under section 3 of the act may be packaged in a noncomplying package for the purpose of making such substance readily available to elderly or handicapped persons unable to use the special packaging. The legislative history of the act clearly indicates that the manufacturer or packer is expected: (1) To use noncomplying packaging only when the required special packaging is of a kind that will create significant difficulty in use for the elderly or handicapped; (2) to make every effort to assure adequate distribution and advertisement of the specially packaged substance; and (3) to choose a noncomplying package in a size most likely to be used by the elderly and handicapped.

Although section 4 contains specific requirements and restrictions, the Commissioner of Food and Drugs concludes that a regulation is needed to establish the parameters for compliance. Most significant is the establishment of placement, size, and prominence specifications adequate to satisfy the statutory requirement that the prescribed labeling to be used on noncomplying packaging appear conspicuously on the package. Such specifications, as set forth below, are based upon regulations issued by the Commissioner pursuant to the Fair Packaging and Labeling Act. With respect to the alternate label statement for packaging too small to accommodate the statutory statement, the Commissioner invites suggestions as to other substitute statements.

Therefore, pursuant to provisions of the Poison Prevention Packaging Act (sec. 4, 84 Stat. 1671; 15 U.S.C. 1473) and under authority delegated to him (21 CFR 2.120), the Commissioner proposes to add the following new section to Part 295:

§ 295.8 Noncomplying package requirements.

(a) *General requirements.* A manufacturer or packer of a household substance subject to the special packaging provisions of §§ 295.2 and 295.3 may package such substance for elderly or handicapped persons in packaging of a single size that does not comply with such provisions if he meets all of the following conditions:

(1) The special packaging required for such substance is of a kind that will create significant difficulty in use for the elderly or handicapped;

(2) The specially packaged substance is supplied by such manufacturer or packer in popular sizes;

(3) The specially packaged substance has been adequately distributed and advertised by such manufacturer or packer;

(4) The noncomplying package is a size most likely to be used by the elderly or handicapped;

(5) The noncomplying package bears the labeling statement specified in paragraph (b) or (c) of this section;

(6) The Commissioner has not issued an order requiring the exclusive use of special packaging for such substance pursuant to paragraph (e) of this section.

(b) *Labeling statement requirements.* (1) The labeling statement, "This Package for Households Without Young Children," shall appear conspicuously on the labeling of all noncomplying packages permitted under paragraph (a) of this section.

(2) The statement required by subparagraph (1) of this paragraph shall appear on the principal display panel which shall be the part of the labeling most likely to be displayed, presented, shown, or examined under customary conditions of display for retail sale. If a package bears alternate principal display panels, the required statement shall appear on each principal display panel, as well as on the principal display panel or panels of any outer container or wrapping used in the retail display of the substance.

(3) The required labeling statement shall appear within the borderline of a square or rectangle on the principal display panel in conspicuous and easily legible capital letters, shall be in distinct contrast, by typography, layout, color, or embossing) to other matter on the package, and shall appear in lines generally parallel to the base on which the package rests as it is designed to be displayed.

(4) The declaration shall be in letters in type size established in relationship to the area of the principal display panel of the package and shall be uniform for all packages of substantially the same size by complying with the following type-size specifications:

(i) Not less than one-sixteenth inch in height on packages the principal display panel of which has an area of 5 square inches or less.

(ii) Not less than one-eighth inch in height on packages the principal display panel of which has an area of more than five but not more than 25 square inches.

(iii) Not less than three-sixteenths inch in height on packages the principal display panel of which has an area of more than 25 but not more than 100 square inches.

(iv) Not less than one-fourth inch in height on packages the principal display panel of which has an area of more than 100 square inches, but not more than 400 square inches.

(v) Not less than one-half inch in height if the area of the principal display panel is more than 400 square inches.

(5) For the purpose of obtaining uniform type size for the required statement for all packages of substantially the same size, the area of the principal display panel is the area of the side or surface that bears the principal display panel, which shall be:

(i) In the case of a rectangular package where one entire side properly can be considered to be the principal display panel, the product of the height times the width of that side.

(ii) In the case of a cylindrical or nearly cylindrical container, 40 percent of the product of the height of the container times the circumference.

(iii) In the case of any other shape of container, 40 percent of the total surface of the container; however, if such container presents an obvious principal display panel such as the top of a triangular or circular package, the area shall consist of the entire top surface.

In determining the area of the principal display panel, exclude tops, bottoms, flanges at the tops and bottoms of cans, and shoulders and necks of bottles or jars. In the case of cylindrical or nearly cylindrical containers, the labeling statement required by this section to appear on the principal display panel shall appear within that 40 percent of the circumference most likely to be displayed, presented, shown, or examined under customary conditions of display for retail sale.

(c) *Alternate labeling statement.* If the area of the principal display panel, as determined in accordance with paragraph (b)(5) of this section, is too small to accommodate the required statement specified in paragraph (b)(1) of this section, the statement "Caution: This Package Is Not Child-Safe" may be used. This alternate statement must comply with the size, placement, and conspicuousness requirements prescribed by paragraph (b) of this section.

(d) *Order of licensed medical practitioner.* A household substance subject to the special packaging provisions of §§ 295.2 and 295.3 and dispensed pursuant to an order of a licensed medical practitioner authorized to prescribe may be packaged in noncomplying packaging only when directed in such order or when requested by the purchaser.

(e) *Exclusive use of special packaging.* (1) The Commissioner may by order require a manufacturer or packer of a household substance subject to the special packaging provisions of §§ 295.2 and 295.3 to package such substance exclusively in special packaging complying with such provisions if:

(i) The household substance is packaged in a noncomplying package under section 4(a) of the act; and

(ii) The Commissioner determines that such substance is not also being supplied by such manufacturer or packer in popular size packages which comply with such provision; and

(iii) Such manufacturer or packer has been given an opportunity to comply with the purposes of the act; and

(iv) The Commissioner finds, after opportunity for hearing, that such exclusive use of special packaging is necessary to accomplish the purposes of the act.

Interested persons may, within 60 days after publication hereof in the FEDERAL REGISTER, file with the Hearing Clerk, Department of Health, Education, and Welfare, Room 6–88, 5600 Fishers Lane, Rockville, MD 20852, written comments (preferably in quintuplicate) regarding this proposal. Comments may be accompanied by a memorandum or brief in support thereof. Received comments may be seen in the above office during working hours, Monday through Friday.

Dated: October 12, 1972.

ROBERT C. BRANDENBURG,
Acting Associate Commissioner for Compliance.

[FR Doc.72-17715 Filed 10-17-72;8:47 am]

FEDERAL COMMUNICATIONS COMMISSION

[47 CFR Part 97]

[Docket No. 19605; FCC 72-896]

AMATEUR RADIO SERVICE

Compensation of Control Operators and Modification of Logging Requirements Regarding Third-Party Communications

In the matter of amendment of Part 97 to allow the compensation in certain instances of control operators of stations operating in the Amateur Radio Service and modification of the logging requirements regarding third party communications, Docket No. 19605.

1. In our report and order adopted today in Docket 19245 we established rules regarding the type of third-party traffic that amateur licensees may properly handle including the compensation of control operators for transmitting such messages. The Commission hereby gives notice of proposed rule making concerning the collateral issues of compensation of amateur club station control operators and possible relaxation of the logging requirement for third-party communications.

2. The American Radio Relay League operates an amateur station that is engaged in multiple address point to point communications. They broadcast bulletins, informational matter, and code practice of particular significance to amateur licensees. This type of communication is highly beneficial to both amateur operators and the Amateur Radio Service and should be encouraged.

3. The equipment used by these stations is in many instances as complex as a standard or FM broadcast station. As a result, it is impractical to operate these stations with volunteers, especially if the station operates for a substantial period each week.

4. The Commission is considering two different solutions. First, we are proposing specific rules which are designed to

allow any bona fide amateur organization to operate a station and provide reasonable compensation to the control operator when the station transmits material solely related to the Amateur Radio Service. The rules, which will be designated as § 97.112(b), set forth specific criteria which a club station must meet in order to provide compensation to their operators. These criteria are designed to insure that stations compensating their operators are in fact engaged in providing a service to a significantly large segment of amateur licensees. Another solution would be to create a new class of amateur station which will be required, before they will be licensed, to make a showing similar to our proposed rules contained below. Comments are invited regarding these two possible solutions and any other proposals regarding this type of operation.

5. Section 97.103(b)(3) requires that an amateur radio station log include a notation of third-party messages sent or received, including names of all participants and a brief description of the message content. The Commission invites comments regarding the usefulness of this requirement and whether it should be modified or deleted.

6. Authority for the proposed rule changes contained herein is contained in sections 4(i) and 303 of the Communications Act of 1934, as amended.

7. Pursuant to applicable procedures set forth in § 1.419 of the Commission's rules, an original and 14 copies of all material requested by this proceeding should be submitted on or before December 20, 1972, and reply comments on or before January 3, 1973. All relevant material will be considered by the Commission. In reaching its decision in this proceeding, the Commission may also take into account other relevant data before it in addition to the specific data invited by this notice. Responses will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters, 1919 M Street NW., Washington, DC.

Adopted: October 5, 1972.

Released: October 11, 1972.

FEDERAL COMMUNICATIONS COMMISSION,[1]
[SEAL] BEN F. WAPLE,
Secretary.

In § 97.112, the present text is designated as paragraph (a) and a new paragraph (b) is added to read as follows:

§ 97.112 No remuneration for use of station.

* * * * *

(b) Control operators of a club station may be compensated when the club station is operated primarily for the purpose of conducting amateur radio communication to provide code practice transmissions intended for persons learning or improving proficiency in the International Morse Code, or to disseminate information bulletins consisting solely of subject matter having direct interest to the Amateur Radio Service provided:

(1) The station is operated weekly for a period of at least 40 hours;

(2) The station schedules operations on all allocated high frequency amateur bands using reasonable measures to maximize coverage;

(3) The schedule of normal operating times and frequencies is published at least 30 days in advance of the actual transmissions.

[FR Doc.72-17737 Filed 10-17-72;8:50 am]

FEDERAL MARITIME COMMISSION

[46 CFR Part 547]

[Docket No. 72-54]

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Establishment of Implementation Procedures; Enlargement of Time To File Comments

Upon request of interested parties, and good cause appearing, time within which comments may be filed in response to the Commission's notice of proposed rule making in this proceeding (37 F.R. 20185; September 27, 1972) is enlarged to and including November 15, 1972.

By the Commission.

[SEAL] FRANCIS C. HURNEY,
Secretary.

[FR Doc.72-17700 Filed 10-17-72;8:45 am]

FEDERAL RESERVE SYSTEM

[12 CFR Part 291]

LABOR RELATIONS PANEL

Elections, Unionization Policy, and Collective Bargaining for Federal Reserve Banks

This statement relates to action of this date by the Board of Governors of the Federal Reserve System in amending the "Policy on Unionization and Collective Bargaining for the Federal Reserve Banks" by adding a new section (published elsewhere in this issue of the FEDERAL REGISTER), relating to "Objections to Election Procedure" covering applicable standards of conduct once it has been shown that an appreciable number of employees at any Reserve bank are interested in labor organization representation.

Under dates of August 6, 1971, and November 4, 1971, three documents were published in the FEDERAL REGISTER: (1) A proposed amendment to the policy, (2) a proposed Code of Preelection Conduct, and (3) proposed Rules and Regulations Pertaining to Preelection Conduct. The amendment would require action by the Board of Governors. The other two documents were proposed by the Panel.

Subsequent to both the first and second publications in the FEDERAL REGISTER, extensive comments were submitted by banks, by a subcommittee to the System Committee on Management Personnel, and by unions.

After careful consideration by the panel of the comments received following publication for comment of the proposed policy amendment, the panel has decided not to issue at this time either a Code of Preelection Conduct or Rules and Regulations Pertaining to Preelection Conduct.

The basic reason for this decision is that the proposed code dealt in large part with hypothetical situations. On further reflection, it is our conclusion that a general statement, supported if necessary by decisions in specific cases, will be a preferable method for implementation of the amendment. While we had hoped that a code would provide helpful guidance, we now believe that a cease-by-case approach will be preferable, at least until enough experience has been obtained to make a code more directly relevant.

Nonissuance of a code at this time is not to be construed as a decision by the panel to withdraw from or alter the so-called "in-between" position that was the central thesis of the proposed code.

Consistent with the unique position of Federal Reserve banks within a private sector-public sector spectrum, rulings by the NLRB and the courts under the provisions of the NLRA (section 9) will provide general guidance for minimum standards of conduct. Greater restraint, however, in the exercise of free speech by a Reserve bank than may be mandated by the NLRA will be expected. On the other hand, the general practice of strict neutrality exercised in the public sector will not be required.

The panel's unanimous July 19, 1971, Opinion and Decision in the Federal Reserve Bank of San Francisco and Professional, Office, and Industrial Union, MEBA (AFL-CIO) case may be examined for further exposition of the so-called "in-between" position, noted in the above paragraph. Moreover, that opinion and decision discusses a number of very specific matters, relevant to that case, that might conceivably arise elsewhere. The panel will adhere to those findings in other situations if the facts should be comparable.

As respects hypothetical questions that might arise, not covered directly by the San Francisco case, the panel will expect Federal Reserve banks and labor organizations to adhere to the spirit and intent of the "in-between" position by exercise of commonsense and good will. As noted earlier, and as empowered by the amendment, the panel will decide such questions in future cases if the need arises. If a Code of Preelection Conduct should be needed, it will be promulgated on the basis of additional experience.

As respects Rules and Regulations Pertaining to Preelection Conduct, the panel likewise concludes that no detailed procedures are needed at this time. If either a labor organization or a Federal Reserve bank believes that there has been a violation of the amendment, prompt notice can be given to the panel. After consultation with the parties, the panel will develop procedures appropriate to the circumstances.

---

[1] Commissioner Johnson dissenting; Commissioner Reid absent.

By order of the Federal Reserve System Labor Relations Panel,[1] October 5, 1972.

PAUL M. METZGER,
Secretary.

[FR Doc.72-17697 Filed 10-17-72;8:47 am]

---

[1] Voting for this action: Chairman Simkin and Governors Daane and Mitchell.

SECURITIES AND EXCHANGE COMMISSION

[17 CFR Part 240]

[Release No. 34-9821]

CUSTOMERS' SECURITIES AND FUNDS

Obligations of Broker-Dealers To Maintain Physical Possession or Control and Certain Reserves; Extension of Time for Comments

In Securities Exchange Act of 1934, Release No. 9775, dated September 14, 1972, which was published in the FEDERAL REGISTER for September 28, 1972, at 37 F.R. 20260, the Securities and Exchange Commission republished proposed § 240.15c3-3 in a revised form. The release stated that the comments should be submitted on or before October 14, 1972.

As a result of requests received from members of the public concerned, notice is hereby given that the time within which such comments may be submitted has been extended from October 14, 1972, until October 24, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

OCTOBER 13, 1972.

[FR Doc.72-17794 Filed 10-17-72;8:51 am]

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

[49 CFR Part 571]

[Docket No. 70-17; Notice 6]

AIR BRAKE SYSTEMS

Notice of Public Meeting; Correction

In the notice of public meeting on Air Brake Systems published October 13, 1972, 37 F.R. 21652, the telephone number for requests for time or equipment was incorrectly given. The correct telephone number is 202—426-2153.

This notice is issued under the authority of section 119 of the National Traffic and Motor Vehicle Safety Act, 15 U.S.C. 1407, and the delegations of authority at 49 CFR 1.51 and 49 CFR 501.8.

Issued on October 17, 1972.

ROBERT L. CARTER,
Associate Administrator,
Motor Vehicle Programs.

[FR Doc.72-17923 Filed 10-17-72;10:56 am]

Notices

DEPARTMENT OF THE TREASURY

Comptroller of the Currency

INSURED BANKS

Joint Call for Report of Condition

CROSS REFERENCE: For a document regarding joint call for report of condition of insured banks, see F.R. Doc. 72-17717, Federal Deposit Insurance Corporation, *infra*.

DEPARTMENT OF DEFENSE

Department of the Army

U.S. ARMY TRANSPORTATION SCHOOL

Notice of Meeting

In accordance with Executive Order No. 11671, dated June 5, 1972, 37 F.R. 11307, annoucement is made of a meeting of the U.S. Army Transportation School Board of Visitors, as follows:

The U.S. Army Transportation School Board of Visitors will meet during the period November 9–11, 1972, in Room 2, Wylie Hall, Fort Eustis, Va. Sessions on Thursday and Friday will commence at 9 a.m. and conclude approximately 3 p.m. The Saturday session will begin at 8:30 a.m. and conclude at approximately 10 a.m.

Agenda subjects will be as follows:

School Status and Forecast.

The Virginia Polytechnic Institute and State University Graduate Program to be offered at Fort Eustis.

The Student Oriented Learning Environment Program with the Transportation Officer Advanced Course and Developments in Nonresident Instruction.

E. W. GANNON,
Lieutenant Colonel, U.S. Army
Chief, Plans Office, TAGO.

[FR Doc.72-17694 Filed 10-17-72;8:45 am]

DEPARTMENT OF AGRICULTURE

Agricultural Stabilization and Conservation Service

[Docket No. SH-302]

WEIGHING OF IMPORTED SUGAR

Notice of Determination

Basis and purpose. This notice is issued pursuant to the authority vested in the Secretary of Agriculture by the Sugar Act of 1948, as amended (61 Stat. 922, as amended) hereinafter referred to as the "Act." The purpose of this notice is to inform all interested parties of the determination made herein pursuant to section 403(c) of the Act.

Section 403(c) of the Act reads as follows: "Whenever the Secretary determines that such is necessary to protect the interest of the United States, consumers of sugar, or the exporters or importers of sugar, he is authorized to require, in accordance with such rules and regulations as he may prescribe, any or all shipments of imported sugar to be weighed by persons not controlled, directly or indirectly, by any person having a direct financial interest in such sugar."

Paragraph (c) was added to section 403 when the Act was amended in October 1971. The history of its inclusion in the Act is summarized briefly as follows: The matter of weighing imported raw sugar was not discussed when the House Committee on Agriculture was considering the 1971 amendments to the Act, nor was the matter mentioned on the floor when vote was taken on the bill by the House. The matter was first brought before the Senate Finance Committee, but only after public hearings had been concluded. It was then proposed that all imported sugar be weighed by public weighers who are not associated with any firm having a "financial interest" in the sugar, e.g., a broker or refiner. The term "dependent weighmaster" was used by the proponents of the amendment to describe such a weigher, and the term "independent weighmaster" was used to describe all others.

The Senate Finance Committee adopted a compromise that would have allowed the present "dependent" weigher (there is only one) to continue to operate, but would have required that any new firm would have to be "independent." The full Senate agreed to this amendment, but when the bill went to conference the conferees were unable to agree to the Senate version, and another compromise resulted in adopting the provision presently in section 403(c) of the Act.

Basis for findings and conclusions. Bulk raw sugar cargos are unloaded and weighed under the supervision of firms that specialize in the weighing of sugar. These firms are called weighmasters and usually represent only the sellers of the sugar. A representative of the buyer or refiner is also present during the weighing of sugar, and if the cargo is of foreign origin a representative of the Bureau of Customs is present during the scale balancing each day and at other periodic intervals.

Most of the raw sugar imported is weighed on automatic batch type scales having weighing hoppers which hold from about 10,000 to 60,000 pounds. When the hopper is filled, the weight is automatically recorded and the sugar is dumped. The same sequence of events is repeated until the ship is unloaded. The scales, though large, are very accurate.

The Bureau of Standards and most individual States have adopted a tolerance which permits scales to vary one-tenth of 1 percent. Scales are tested with test weights at the beginning of each unloading operation and usually at 12-hour intervals thereafter until loading is completed. Scales are usually disassembled and serviced annually. Self-contained check weights are tested at 6-month intervals. The testing of check weights and the disassembly and servicing of scales are performed under the supervision of a customs official, a representative of a weighmaster firm (designated by the Weighmasters Association at Atlantic ports), and a State official responsible for weights and measures.

The Association of American Weighmasters represents all firms engaged in weighing ship cargos of any kind at Atlantic coast ports: There are 17 member firms, but only four weigh sugar. Of these four, three have full membership and one is an associate member. The associate member is denied full membership by the rules of the association due to its affiliation with a sugar brokerage firm, and is permitted to weigh sugar only for its parent firm. The association is the sole bargaining agent for the weighmaster firms with the weigher's union (United Weighers and Sugar Samplers Association, ILA). The weighing firms or weighmasters usually employ several full-time weighers, called steadies, and hire the other necessary weighmen from a union pool.

In addition to supplying the broker or importer of sugar with a weight certificate, weighmasters keep the importer informed of all problems involved in unloading and weighing a cargo and also provide assistance to the importer in case of disputes with refiners and shipowners. For their services, weighmasters charge in excess of 60 cents a ton of sugar in the Northeast and somewhat less in the Gulf.

The discharge weights of foreign sugar determined under the supervision of a weighmaster are used in the determination of refiner payments to the seller, charges to sugar quotas established under the Sugar Act and payment of customs duties.

A public hearing was held in Washington, D.C., on February 29, 1972, at which interested persons were afforded the opportunity to testify or submit information likely to be of assistance to the Secretary in determining if it is necessary, in order to protect the interest of the United States, consumers of sugar, or the buyers or sellers of imported sugar, to issue regulations requiring that the weighing of sugar imported into the

United States be limited to only those persons not controlled, directly or indirectly, by any person having a direct financial interest in such sugar. Testimony was given and/or supplemental evidence was received from representatives of one dependent and several independent sugar weighing firms, raw sugar sellers, sugar brokerage firms, the United States Cane Sugar Refiners' Association, the Association of American Weighmasters, and the U.S. Bureau of Customs. The testimony and supplemental evidence are briefly summarized in the following paragraphs. Hereinafter, a weighing firm controlled by anyone having a direct financial interest in the sugar being weighed shall be referred to as a dependent or affiliated firm, while a weighing firm not controlled by a firm having a direct financial interest in the sugar being weighed shall be referred to as an independent or nonaffiliated firm.

A representative of Sugar Brokers, Inc., a broker engaged in selling approximately 80,000 tons of Philippine raw sugar annually, testified that accurate weights can only be determined by independent weighmasters since that is their sole business activity and accuracy is their only motivation. He stated that a conflict of interest exists when a weigher of sugar is affiliated with a company which buys and sells sugar.

The witness for R. Markey & Sons, Inc., an independent weigher of sugar, testified that the interests of the sellers of sugar and the United States in sugar quota and duty are not protected in a manner intended by Congress when the weighing of sugar is controlled by a person with a financial interest in the sugar being weighed. In support of his views, he stated that the dependent weighing company had a conflict of interest and the lack of motivation for obtaining accurate weights; that influence may be exerted on the affiliated company through the parent company so as not to offend the refiner customer in disagreements over weighing and spillage; and, maintaining a desirable business relationship with the refiner buyers would take precedence over the desire to be entirely objective in obtaining accurate weights.

The witness also testified that the affiliated operator could offer "package deals" to the foreign seller of sugar which include weighing and, therefore, have a competitive advantage over independent weighmasters; and since the revenues from weighing sugar are small as compared to the total revenue accruing to the parent company on a cargo of sugar, more attention will be given to customer relations than to determining the most accurate weight. The witness stated that he had no indications of specific irregularities, fraud, or wrongdoing. However, at the hearing and in a brief submitted subsequent to the hearing, he cited several examples of irregularities which he had discovered but had gone unreported by the dependent weigher despite the fact that the dependent weigher had used the scales with the same amount of evidence indicating errors. Further, in the brief, the witness pointed out that only the weigher, who is present at all times at the scales, can guarantee accurate weighing and that the checks and requirements of the U.S. Bureau of Customs and other interested parties though needed, are not adequate to guarantee accurate weights.

The representative of William C. Galligan & Son, Inc., an independent weighmaster, recommended that regulations be adopted requiring all shipments of imported sugar to be weighed by persons not controlled by anyone having a financial interest in such sugar or, if this is not possible, precluding the establishment of any new dependent weighmasters. In support of his recommendation, the witness again cited conflict of interest and the lack of motivation on the part of dependent weighers. He noted that a broker can offer a producer a complete package whereby he arranges financing, shipping, and insurance, and could conceivably be tempted to make those services dependent upon the choice of a weighmaster whose ownership is under his control. He further stated that in the interests of objectivity and fairness to the producers, steps should be taken to preclude the possibility of such practices. In answer to questioning, the witness stated that the incentive for the independent weighmaster is different than for the dependent weighmaster; that the independent weigher is dependent upon his competence and how thoroughly he does his job; that the independent weighmaster does not have anyone guaranteeing his employment; and that the independent earns his living on how well he performs his job.

In a supplemental brief submitted subsequent to the hearing, the witness stated that the sugar regulation should at least have the following stipulations; (1) That weighmasters disclose their dependency in all solicitations for business and in all contracts, (2) that a written conspicuous disclosure be made to all foreign producers or exporters informing them that they are not required to use the service of the named dependent weighmaster and could select their own, and (3) that the Department's Sugar Quota Clearance Record be accompanied by a statement indicating that the foreign producer was informed of his rights in selecting a weighmaster.

The representative of the Venezuelan Sugar Distributors, in a brief, recommended exclusive use of independent weighmasters in international sugar transactions.

The representative of International Weighers, Inc. (an affiliate of Czarnikow-Rionda Co., a firm engaged in business as a sugar broker and trader), testified that an affiliated weighmaster has the same interest in the sugar being weighed as an independent weighmaster insofar as to give the best possible service to his client and that International Weighers, Inc., has had no complaints from importers, buyers, or from U.S. Customs as to their competence or integrity. He stated that all weighmen used by weighmasters, whether dependent or independent, are members of the same union and that with the exception of a few steady employees, are obtained from the same union "pool". The witness stated that the "package deal" claim made by the proponents of a change in the regulations is not true in that: (1) The selection of the weighmaster is separate and negotiated independently of the purchase contract, (2) weighing is discussed only after purchase, and (3) the foreign seller has complete freedom in selecting the weigher. The witness further testified that the rules of the Association of American Weighmasters, Inc., prohibit International Weighers, Inc., from bidding on the weighing of sugar handled by brokers or traders other than Czarnikow-Rionda Co., and that International Weighers, Inc., believes the weighing of sugar is adequately protected through Customs, the Bureau of Standards, the Sugar Exchange, and the buyer-seller representation at the weighing. The witness stated that the attacks made on the integrity of International Weighers, Inc., are without foundation and are designed not to protect the seller or the public but to serve the private interests of the independent weighmasters by eliminating the competition of International Weighers, Inc., or any future affiliated weighmasters. He pointed out that the weighing scales are subject to balancing at zero and at capacity with test weights at the beginning of unloading and at noon each day or more often if necessary. The daily checks are made usually in the presence of Customs officials and all parties must agree that the scale is balanced. The witness noted that the U.S. Department of Treasury requires scales and test weights to be checked semiannually and a full disassembled test to be made annually in the presence of Customs, the refiner, the scale manufacturer, weighmaster, and in some ports, local officials.

The witness presented statements from the Philippine Department of Industry and Commerce and from various Philippine exporters indicating complete satisfaction with the service provided by International Weighers, Inc. Similar statements were also presented in regard to the weighing of Australian and Fiji sugar along with a letter from the Venezuelan Sugar Distributors (recommendation previously summarized) that indicated though they have not used the services of International Weighers, Inc., they have heard of the honest and efficient work they provide. In response to questioning, the witness stated that they do not act as weighmaster on all the sugar handled by Czarnikow-Rionda; that they act as weighmaster only on sugar handled by Czarnikow-Rionda; and that they have had no complaints from seller-importers, refiners, or Customs. In a supplemental brief, the witness argued in opposition to the "examples" of irregularities cited by the independent firm of R. Markey & Sons, Inc. questioning the integrity and competence of

International Weighers, Inc., and emphasized that sugar trading is fiercely competitive and that no "cozy relationship" exists with refiners.

The president of the U.S. Cane Sugar Refiners' Association, testified that his association was opposed to any regulations which would stipulate how and by whom sugar imported from foreign countries would be weighed. In support of his recommendation, the witness stated that foreign sugar represents about 45 percent of the total U.S. requirements and any regulation made governing this percentage and ignoring the remaining 55 percent was illogical; and that present weighing practices adequately protect the government interest as to duty and quota integrity as well as the private parties concerned. He stated that the Bureau of Customs has always exercised close control over the weighing of imported sugar and has ample authority to regulate the operations for both duty and quota purposes. The witness concluded his testimony by describing weighing procedures and presented several exhibits on weighing and sampling procedures. In answer to questioning, the witness stated that as refiners they have no objection as to whether a dependent or independent weighmaster employed by the seller weighs the sugar; that the seller has the privilege of selecting the weighmaster; that the adoption of regulations permitting only independent weighers would create a monopoly; that they are unable to discern any differences in performance or efficiency among the various weighing firms; and that they are reluctant to see the Sugar Act further complicated and confused by regulations which are totally unnecessary.

The representative of Cargill, Inc., a sugar broker and trader testified that they are opposed to any regulation which would limit any importer from engaging in weighing sugar. The witness stated that under the assumption that membership in the Association of American Weighmasters is a prerequisite to becoming a licensed weighmaster, the Rogers Terminal & Shipping Corp. (a subsidiary of Cargill) has attempted, since January 1970, to have its membership application in the Association processed without success or explanation. He further stressed that any action taken by the Department should be to promote entry of raw sugar weighing firms rather than limit them in order to insure a more competitive market for weighing services.

A representative of Amerop Corp., a seller of raw sugar, in a brief submitted subsequent to the hearing, recommended that no action be taken which would further reduce their choice in the selection of weightmasters. He stated that as a seller of raw sugar he is keenly interested in obtaining the most accurate weights and wishes to see complete and careful discharge of all cargos. He further pointed out that as a seller, they hold complete financial risk for the outturn weights; and that affiliation with another firm does not affect the qualifications of a weigher.

The Association of American Weighmasters, in a brief submitted subsequent to the hearing, presented material on their operations including a listing of the membership, a copy of the bylaws, and a copy of the collective bargaining agreement between the Association and the United Weighers and Sugar Sampler Association, Local 3, ILA. He stated that of the 17 members in the Association, only four firms weigh sugar; that of these four, three have full membership and one is an associate member with no voting privileges since, by rules of the Association, it is affiliated with a sugar brokerage firm; and that the Association is the sole bargaining agent with the weigher's union.

A representative of the U.S. Bureau of Customs submitted the following statement summarizing Customs regulations and procedures: "Customs regulations require that when dutiable sugar is to be imported in bulk, a full description of the facilities to be used in unloading the sugar shall be submitted to the Bureau as far as possible in advance of the date of importation, and special instructions will be issued as to the methods to be applied in weighing such sugar. With regard to the actual weighing of such sugar, the instructions of the Bureau to our field personnel state that all scales used shall be balanced before each day's use and at such intervals during the day as the weighing inspector considers necessary. Hopper scales having self-contained check weights shall be tested with such weights at least once each day when in use, and the check weights shall be verified against standard test weights at least semiannually. Additionally, reports from our field offices state the representatives are usually present from both the purchaser and seller of the merchandise, in addition to the Customs officer."

In arriving at the findings and conclusions set forth in this notice, all proposed findings and conclusions were carefully and fully considered in conjunction with the record evidence pertaining thereto.

Findings and conclusions. On the basis of the record of the hearing I hereby find and conclude that: (1) Weighmasters are those persons who usually represent the sellers of sugar in the unloading and weighing of sugar from ships. (2) The term "dependent weighmaster" is used to identify a weigher of sugar who is associated with a firm having a financial interest in the sugar being weighed while "independent weighmaster" is used to identify all other weighers of sugar. (3) The weighmen who do the actual weighing for both dependent and independent weighmasters are members of the same union and, except for some full-time weighmen who work for only one weighmaster, are assigned to jobs from a union pool without regard to employer. (4) The U.S. Bureau of Customs has the responsibility for protecting customs revenue and the primary responsibility for the integrity of weights. (5) U.S. Customs representatives observe or participate in testing scales before and during weighing along with weighmen of buyers and sellers of sugar. (6) The U.S. Bureau of Standards in conjunction with the States has determined that sugar scales should operate within one-tenth of 1 percent tolerance. (7) The hopper scales customarily used in weighing offshore sugar have self-contained check weights, that are tested with external check weights at least once each day when in use. These external check weights are further verified against standard test weights at least semiannually. (8) All scales are balanced before each day's use and at such intervals during the day as the weighing inspector considers necessary. (9) Refiner-buyers, with few exceptions, concurrently weigh sugar with a weighmaster representing the seller of sugar. (10) The foreign seller of sugar has the right to choose any weighmaster he may wish to represent him. (11) No information was received which indicated that any seller of sugar was dissatisfied with the services provided by International Weighers, Inc., the only dependent weighmaster. (12) Prohibiting dependent weighmasters from weighing sugar would tend to reduce competition. (13) Sugar program operations should not be complicated with unnecessary regulations on the weighing of raw sugar since present trade practices protect all interests. (14) The record of the hearing does not give support to a determination that a depending weighmaster should be prohibited from weighing imported sugar.

Determination. On the basis of the record of the hearing (SH-302) and the findings and conclusions, stated herein, it is hereby determined that no action is necessary pursuant to the provisions of paragraph (c) of section 403 of the Act.

Signed at Washington, D.C., on October 12, 1972.

KENNETH E. FRICK,
Administrator, Agricultural Stabilization and Conservation Service.

[FR Doc.72-17722 Filed 10-17-72;8:48 am]

Forest Service

GILA WILDERNESS PROPOSAL

Availability of Draft Environmental Statement

Pursuant to section 102(2)(C) of the National Environmental Policy Act of 1969, the Forest Service, Department of Agriculture, has prepared a draft environmental statement for the Gila Wilderness Proposal, USDA-FS-DES (Leg) 73-24.

The environmental statement proposes that portions of the Gila Primitive Area to be designated as Gila Wilderness and added to the Gila Wilderness.

The draft environmental statement was filed with CEQ on October 5, 1972.

Copies are available for inspection during regular working hours at the following locations:

USDA, Forest Service, South Agriculture Building, Room 3230, 14th Street and Independence Avenue SW., Washington, D.C. 20250.
USDA, Forest Service, Southwestern Region, 517 Gold Avenue SW., Albuquerque, NM 87101.
Gila National Forest, 301 West College Avenue, Silver City, NM 88061.

Copies are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151; and Colorado Plateau Environmental Advisory Council, Post Office Box 1389, Flagstaff, AZ 85001. Please refer to the name and number of the environmental statement above when ordering.

A limited number of single copies are available upon request to William D. Hurst, Regional Forester, Southwestern Region, U.S. Forest Service, 517 Gold Avenue SW., Albuquerque, NM 87101.

Copies of the environmental statement have been sent to various Federal, State, and local agencies as outlined in the Council on Environmental Quality Guidelines.

Comments are invited from the public and from State and local agencies which are authorized to develop and enforce environmental standards, and from Federal agencies having jurisdiction by law or special expertise with respect to any environmental impact involved for which comments have not been requested specifically.

Comments concerning the proposed action and requests for additional information should be addressed to Forest Supervisor Richard C. Johnson, Gila National Forest, 301 West College Avenue, Silver City, NM 88061. Comments must be received within 30 days of the date of this notice in order to be considered in the preparation of the final environmental statement.

Dated: October 12, 1972.

PHILIP L. THORNTON,
Deputy Chief, Forest Service.

[FR Doc.72-17724 Filed 10-17-72;8:47 am]

Office of the Secretary

ORGANIZATION AND DELEGATIONS

Statement Regarding Redelegations on Temporary Basis

The notice published in 36 F.R. 21529 (November 10, 1971) with respect to delegations of authority within the Department of Agriculture stated that delegations of authority to those agencies and offices reporting directly to the Secretary of Under Secretary had been reconfirmed for a 90-day period, effective October 20, 1971. Notices published in 37 F.R. 888 (January 20, 1972), 37 F.R. 7725 (April 19, 1972), and 37 F.R. 14245 (July 18, 1972), provided for additional 90-day extensions. Such period, as extended, is hereby further extended until further notice.

Dated: October 13, 1972.

RICHARD E. LYNG,
Acting Secretary of Agriculture.

[FR Doc.72-17769 Filed 10-17-72;8:51 am]

Soil Conservation Service

HORSE RANGE SWAMP WATERSHED PROJECT, S.C.

Availability of Final Environmental Statement

Pursuant to section 102(2)(C) of the National Environmental Policy Act of 1969, the Soil Conservation Service, U.S. Department of Agriculture, has prepared a final environmental statement for the Horse Range Swamp Watershed Project, Orangeburg County, S.C., USDA-SCS-ES-WS-(ADM)-73-9(F).

The environmental statement concerns a plan for watershed protection, flood prevention, and agricultural water management. The planned works of improvement include conservation land treatment throughout the watershed, supplemented by 25 miles of multiple-purpose channel work for flood prevention and agricultural water management.

The final environmental statement was transmitted to CEQ on October 3, 1972.

Copies are available for inspection during regular working hours at the following locations:

Soil Conservation Service, USDA, South Agriculture Building, Room 5227, 14th and Independence Avenue SW., Washington, D.C. 20250.
Soil Conservation Service, USDA, 901 Sumter Street, Columbia, SC 29201.

Copies are also available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151. Please order by name and number of statement. The estimated cost is $4.40.

Copies of the environmental statement have been sent to various Federal, State, and local agencies as outlined in the Council on Environmental Quality Guidelines.

Dated: October 12, 1972.

J. W. HAAS,
Acting Deputy Administrator for Watersheds, Soil Conservation Service.

[FR Doc.72-17723 Filed 10-17-72;8:47 am]

DEPARTMENT OF COMMERCE

Bureau of International Commerce

[Case 436(CP-22)]

VEECO INSTRUMENTS, INC.

Order Imposing Civil Penalties and Placing Respondent on Probation for Export Control Violations

In the matter of Veeco Instruments, Inc., Terminal Drive, Plainview, N.Y. 11803, respondent, Case No. 436(CP-22).

The Director, Compliance Division, Office of Export Control, Bureau of International Commerce, issued a charging letter on May 30, 1972, charging the above respondent with violations of the regulations issued under the Export Control Act of 1949 and the Export Administration Act of 1969.[1] The charging letter alleges in substance the following: (1) On 12 occasions between March 1, 1968, and March 1, 1970, respondent knowingly exported to three of its subsidiaries in Europe certain commodities without applying for or obtaining the required validated export licenses; (2) on January 20, 1970, the respondent through its subsidiary in France reexported to U.S.S.R. for exhibition at a scientific fair in Moscow certain U.S.-origin commodities without obtaining from the Office of Export Control the required authorization for such reexportation. The respondent was duly served with the charging letter and appeared in the proceedings through an attorney.

Pursuant to § 388.10 of the Export Control Regulations, with agreement of the Director, Compliance Division, there was submitted to the Hearing Commissioner a consent proposal for the issuance of an order imposing a civil penalty and placing respondent on probation for 6 months. In said consent proposal the respondent, for the purpose of this compliance proceeding only, did not contest or deny the violations set forth in the charging letter of May 30, 1972. The respondent waived: (1) All rights to oral hearing before the Hearing Commissioner; (2) all rights of administrative appeal from and judicial review of said order; and (3) all rights to request refund of any civil penalty imposed pursuant to the consent proposal. It consented to an order imposing the civil penalties hereinafter set forth and probation for 6 months.

The Hearing Commissioner has considered the facts in the case and the respondent's proposal. He has approved the proposal and recommended that it be accepted. The undersigned, having considered the Hearing Commissioner's report and the consent proposal, hereby makes the following:

FINDINGS OF FACT

1. The respondent Veeco Instruments, Inc., with a place of business in Plainview, N.Y., is a producer of high and ultra high vacuum systems, vacuum measuring and control instruments and related components and accessories. The respondent has several subsidiaries including Veeco S.A., in France, Veeco G.m.b.H. in West Germany, and Veeco Instruments, Ltd., in England.

---

[1] Section 13(b) of this Act (50 U.S.C. APP. 2412(b)) provides, "All outstanding delegations, rules, regulations, orders, licenses, or other forms of administrative action under the Export Control Act of 1949 * * * shall, until amended or revoked, remain in full force and effect, the same as if promulgated under this Act."

2. During the period from March 13, 1968, to February 27, 1970, the respondent exported from the United States to its abovementioned subsidiaries a total of 12 shipments of thin film deposition equipment. Six shipments were made to France, three to West Germany, and three to England. Each exportation required a validated export license from the Office of Export Control which respondent did not apply for or obtain. The respondent knew or had reason to know that such a license was required in each instance.

3. Investigations after the exportations were made disclosed that the ultimate destination of the equipment in each instance was to a destination that would have been authorized by the Office of Export Control. If proper applications for export licenses had been filed they would have been approved. By failing to apply for the license before making the exportations the respondent precluded the Office of Export Control from determining in advance if the ultimate consignee would be approved for receipt of the equipment.

4. On January 27, 1970, the respondent through its subsidiary in France reexported from France to U.S.S.R. for exhibition at a scientific fair in Moscow a high vacuum thin film evaporator system and an ion pumped fast cycle system, both of U.S. origin. The respondent knew or should have known that the reexportation of this equipment from France to U.S.S.R. required prior authorization from the Office of Export Control. Neither respondent nor it subsidiary in France had applied for or obtained such authorization.

5. Within a few days of the arrival in Moscow of the equipment referred to in the previous finding the Office of Export Control learned of its presence there. At the request of the Office of Export Control the equipment was promptly returned to respondent's subsidiary in France.

Based on the foregoing, I have concluded that respondent violated §§ 387.4 and 387.6 of the United States Export Control Regulations in that on 12 occasions it knowingly exported commodities from the United States to France, West Germany, and England without having obtained the required validated export licenses for such exportations. I have also concluded that respondent violated §§ 387.2, 387.4, and 387.6 of said regulations in that it knowingly caused the reexportation of U.S.-origin commodities from France to U.S.S.R. without obtaining the specific authorization which was required for such reexportation.

On consideration of the record in the case, I hereby accept the consent proposal: *And it is hereby ordered,*

I. Pursuant to § 388.1(a)(4) of the Export Control Regulations, civil penalties totaling twenty-two hundred dollars ($2,200) are hereby imposed on respondent. One-half of said penalty (eleven hundred dollars, $1,100) is payable to the Treasurer of the United States upon issuance of this order. Payment of the balance is held in abeyance as hereinafter set forth.

II. Not later than 6 months after the date of said order, the Compliance Division, Office of Export Control, will transmit a report to the Hearing Commissioner containing (a) a description of the procedures adopted by the firm to prevent reoccurrence of violations of the Export Administration Act of 1969, as amended, and regulations issued thereunder, and (b) any violations which may have been committed during the aforesaid period. Thereafter, within a reasonable time the Hearing Commissioner, based upon said report, will make a finding as to whether the firm is in substantial compliance with the Export Administration Act as amended, and regulations thereunder, and report to the Director OEC.

III. If it is found that the firm is in substantial compliance, payment of the balance of the penalty ($1,100) will be waived and the firm notified accordingly.

IV. If it is found that the firm is not in substantial compliance, the firm will be notified that the balance of the civil penalty ($1,100) is due and payable to the Treasurer of the United States. If the balance of said penalty is not paid within 5 days of said notification, a supplemental order denying all export privileges to the firm may be issued for a period not to exceed 1 year from the date of initial order.

V. If, in the discretion of the Compliance Division, Office of Export Control, and the Office of General Counsel, such action is warranted, new proceedings may be initiated against the firm pursuant to 15 CFR 388.3, based upon any violations described in the aforesaid report by the Hearing Commissioner or upon any other violations committed by the firm subsequent to the date of, but not contained in, the charging letter by which this proceeding was initiated.

VI. In addition to the foregoing civil penalties the respondent is placed on probation for a period of 6 months from the date of this order. The conditions of probation are that respondent shall fully comply with all requirements of the Export Administration Act of 1969 as amended by the Equal Export Opportunity Act and all regulations, licenses, and orders issued thereunder.

VII. Upon a finding by the Director, Office of Export Control, or such other official as may be exercising the duties now exercised by him, that the respondent has knowingly failed to comply with the requirements and conditions of this order or with any of the conditions of probation said official, without notice, when national security or foreign policy considerations are involved, or with notice if such considerations are not involved, by supplemental order may revoke the probation of said respondent, revoke all outstanding validated export licenses to which said respondent may be a party, and deny to said respondent all export privileges for the period of the order. Such supplemental order shall not preclude the Bureau of International Commerce from taking such further action for any violation as it shall deem warranted. On the entry of a supplemental order revoking respondent's probation without notice, it may file objections and request an oral hearing as provided in § 388.16 of the Export Control Regulations, but pending such further proceedings the order of revocation shall remain in effect.

Dated: October 12, 1972.

WILSON E. SWEENEY,
Acting Director,
Office of Export Control.

[FR Doc.72-17770 Filed 10-17-72;8:50 am]

CIVIL AERONAUTICS BOARD

[Docket No. 24817; Order 72-10-34]

AIR TRAFFIC CONFERENCE OF AMERICA

Order Deferring Action and Requesting Comments Regarding Standard Agent's Ticket and Area Settlement Plan

Issued under delegated authority October 11, 1972.

The Air Traffic Conference of America (ATC), on behalf of its air carrier members, has filed with the Board under section 412 of the Federal Aviation Act of 1958, as amended (the Act) an agreement proposing changes in the ATC Standard Agent's Ticket and Area Settlement Plan.

The Agreement deals in part with two general areas of air carrier/travel agent relations, i.e., (1) the required use of Standard Agents' tickets for all travel to or from the United States; and (2) the reporting of credit card sales.[1]

It appears that the agreement raises issues of importance to ATC and IATA agents and others. Accordingly, it has been decided to defer action on the matter temporarily and to allow an opportunity for interested persons to file written comments in support of or in opposition to the agreement and its various provisions.[2]

The provisions of the Settlement Plan affected by the agreement[3] and the principal changes provided for in the agreement are as follows.

(1) Paragraph 20—*The use of carrier ticket stock under a Special Supplemental Agreement* [Amended]

At the present time participants in the Settlement Plan cannot, for the most part, furnish an agent with a supply of participants' ticket forms or exchange orders. However, under certain circumstances participants may provide agents with participants' ticket stock for use in international travel. In such cases, the agent is required to report and remit to the carrier not later than the 1st and 16th days of each calendar month. Under the agreement before the Board, it appears that participants would no longer be able to enter into Supplemental Agreements with their agents and provide the agents with participants' ticket stock. The foregoing remitting frequencies would no longer apply and the agent would have to report international sales three times a month, which accords with the existing reporting arrangement for domestic sales.

---

[1] Other provisions relating to proposed increases in the bonding requirements applicable to agents are being separately considered.

[2] The provisions of the agreement are intended to become effective after approval by the Civil Aeronautics Board.

In addition to those arrangements mentioned above, participants in the Settlement Plan may, at the present time, furnish agents which are under IATA appointment with participants' own ticket forms to be issued for transportation to or from points outside the area of the Continental United States, Hawaii, and Canada. Under the agreement it appears that participants in the Settlement Plan would no longer be able to provide their own ticket forms to agents under IATA appointment and located within the area to which the Settlement Plan applies.

At the present time if an ATC approved agent is temporarily unable to issue Standard Agent's tickets for certain reasons then a participant may, during the period of the emergency, authorize the use of ticket forms supplied under IATA appointment for domestic air transportation. It appears that the agreement would eliminate this particular provision from the Agency Resolution.

(2) Paragraph 31—*Specifies the form of the Special Supplemental Sales Agency Agreement* [Deleted]

The Agreement eliminates the Supplemental Agreement under which carriers have provided their own ticket forms to agents subject to the Settlement Plan.

(3) Paragraph 22—*Provides for, inter alia, the issuance by an agent of a carrier's ticket forms pursuant to a Supplemental Agreement or an IATA Passenger Sales Agency Agreement*—Amended.

The Agreement deletes those provisions providing for the issuance of a carrier's ticket forms by an agent who has entered into a Supplemental Agreement or to whom a carrier has issued ticket forms pursuant to an IATA Passenger Sales Agency Agreement.

(4) Paragraph 34—*Provides, inter alia, for the use of a standard form of Agency Sales Report to be used by agents in connection with sales under Supplemental Agreements*—[Amended.]

The Agreement deletes reference to an Agency Sales Report to be utilized in connection with Supplemental Agreements.

(5) Paragraph 47—*Provides for withdrawal of IATA ticket stock where ATC and IATA reporting and remitting procedures have become uniform in the United States and/or Canada*[4]—[Amended.]

The Agreement provides for the immediate withdrawal of all IATA ticket stock from all ATC agents located within the area in which the Settlement Plan applies.

(6) Paragraph 23—*Provides for, inter alia, the reporting and remitting three times each month by ATC agents subject to the Settlement Plan*—[Amended.]

The Agreement adds transportation receipts and other required documents accepted by the agent in payment for air transportation sold pursuant to credit card plans accepted by the carrier and in addition to the Universal Air Travel Plan to (a) those items to be reported on an agent's sales report and (b) those items to be held in trust by an agent as property of a carrier participant in the Settlement Plan. In addition, the Agreement adds to the Sales Agency Agreement a provision that: "No Agent may report to the carrier the sale of any air transportation as a credit card transaction where at any time the agent bills, invoices, or receives payment in cash from the customers for such air transportation, or where the agent purports to act as agent for the customer with respect to any aspect of the credit card transaction."

In connection with the foregoing, it would be helpful to receive comments from all interested persons. Explanation submitted by the carriers should include, but not be limited to, answers to the following questions:

1. What are the specific reasons for adoption of each of the proposed revisions in the Settlement Plan listed in items (1) through (6) above?

2. What is the practical effect (in terms of the type of ticket forms which may or may not be used, air transportation to be covered under the Settlement Plan, increases in remitting frequencies, etc.) of the proposed revisions listed in items (1) through (6) above on (a) ATC appointed agents located in the continental United States, Alaska, Hawaii, and Canada, (b) agents in the continental United States, Alaska, Hawaii, and Canada holding both ATC and IATA appointments; and (c) agents in the continental United States, Alaska, Hawaii, and Canada holding only IATA appointments?

3. What is the practical effect of the proposed revisions on air carriers, foreign air carriers and other carriers participating or concurring in the Settlement Plan insofar as the issuance of their own ticket forms to appointed agents is concerned. In this connection, what effect will the proposed revisions have on any carrier's right pursuant to section II-D of the ATC Agency Resolution which exempts an ATC member from certain provisions of such resolution with respect to transportation between the continental United States and Alaska or Hawaii or between points within Alaska to meet the practices of competitors not bound by the resolution?

4. Will, as a result of any of the provisions of the Agreement, (a) the bond required of ATC agents cover sales between the continental United States, Alaska, Hawaii, Canada, or any combination thereof; and (b) the use of Standard Agent's tickets be mandatory for air transportation within and between all of the aforesaid areas, as well as between the United States, on the one hand, and any of its possessions or territories, on the other hand?

5. At the present time, to what extent must ATC agents writing tickets for air transportation between the continental United States, Alaska, Hawaii, and Canada abide by the provisions of the Settlement Plan including the use of Standard Agent's tickets, reporting procedures, etc.?

6. To what extent, if any, do the provisions of the Agreement conflict with those existing IATA procedures and resolutions affecting air transportation or foreign air transportation and approved by the Board insofar as the use of an individual carrier's own ticket stock, or, if applicable, an IATA standard ticket, is concerned?

We have decided to allow the air carrier members of ATC a period of 14 days within which to comment on the questions posed herein. Upon receipt of these comments we shall allow a further period for comments, if any, by other interested persons in support of, or in opposition to, the Agreement. Thereafter, we shall allow a further period for rebuttal comments, if any, by those persons filing initial comments pursuant to this order.

Acting pursuant to authority duly delegated by the Board in the Board's Regulations, 14 CFR 385.3, it is concluded that it is in the public interest to defer action on the Agreement in order to permit interested persons to file comments as provided for herein.

Accordingly, it is ordered, That:

1. Action on Agreement CAB 16874-A29 be and it hereby is deferred;

2. The air carrier members of ATC be and they hereby are afforded an opportunity to file comments on Agreement CAB 16874-A29, as discussed herein, within 14 days from the date of this order;

3. All other interested persons are afforded a further period not exceeding 21 days from the date of this order to file comments in support of or in opposition to Agreement CAB 16874-A29;[5]

---

[3] The underlined captions for each paragraph of the Settlement Plan reflect the present purpose for each such paragraph.

[4] Paragraph 47 in its existing form has not yet been acted upon by the Board due to the lack of uniformity in ATC and IATA reporting and remitting procedures.

[5] We note that Pan American World Airways, Inc., the Association of Retail Travel Agents, and Ultramar Travel Bureau, Inc., have already filed comments concerning the Agreement. These comments, as well as such additional comments as may be filed pursuant to this ordering paragraph, will be considered in reaching final decision in this proceeding.

4. Rebuttal comments may be filed by those persons filing initial comments pursuant to paragraph 2 hereof within 28 days of the date of this order;

5. This order shall be served upon the air carrier members of the Air Traffic Conference of America, the American Society of Travel Agents, the Association of Retail Travel Agents, and the Department of Justice;

6. Comments filed pursuant to ordering paragraphs 2, 3, and 4 shall be served on all persons named in ordering paragraph 5;[6]

7. Rebuttal comments filed pursuant to ordering paragraph 4 shall be served upon all persons filing initial comments pursuant to ordering paragraph 3; and

8. This proceeding shall be assigned Docket 24817.

This order shall be published in the Federal Register.

Persons entitled to petition the Board for review of this order pursuant to the Board's Regulations, 14 CFR 385.50, may file such petitions within 10 days after the date of this order.

This order shall be effective and become the action of the Civil Aeronautics Board upon expiration of the above period unless within such period a petition for review thereof is filed, or the Board gives notice that it will review this order on its own motion.

[SEAL] Harry J. Zink,
Secretary.

[FR Doc.72-17758 Filed 10-17-72;8:50 am]

[Docket No. 24573]

WARDAIR CANADA, LTD.

Notice of Hearing

Notice is hereby given, pursuant to the provisions of the Federal Aviation Act of 1958, as amended, that a hearing in the above-entitled proceeding is assigned to be held on November 6, 1972, at 10 a.m., local time, in Room 503, Universal Building, 1825 Connecticut Avenue NW., Washington, DC before the undersigned.

For information concerning the issues and other details involved in this proceeding, interested persons are referred to the prehearing conference report, served October 11, 1972, and other documents in this proceeding on file in the Docket Section of the Civil Aeronautics Board.

Dated at Washington, D.C., October 12, 1972.

[SEAL] Frank M. Whiting,
Administrative Law Judge.

[FR Doc.72-17759 Filed 10-17-72;8:50 am]

---

[6] An original and two copies of all comments filed pursuant to ordering paragraphs 2, 3, and 4 hereof shall be filed with the Board's Docket Section.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

[Docket No. D-72-206]

ACTING ASSISTANT SECRETARY FOR EQUAL OPPORTUNITY

Designation

During the current vacancy in the position of Assistant Secretary for Equal Opportunity, Malcolm E. Peabody, Jr., is designated to serve as Acting Assistant Secretary for Equal Opportunity with all the powers, functions, and duties delegated or assigned to the Assistant Secretary for Equal Opportunity.

(Sec. 7(d), Department of HUD Act, 42 U.S.C. 3535(d))

Effective date. This designation shall be effective September 6, 1972.

George Romney,
Secretary of Housing and Urban Development.

[FR Doc.72-17726 Filed 10-17-72;8:47 am]

[Docket No. D-72-205]

REGIONAL ADMINISTRATORS AND DEPUTY REGIONAL ADMINISTRATORS

Designation and Redelegation of Authority With Respect To Administering Oaths Required in Connection With Employment

Section A. *Designation and redelegation.* Each Regional Administrator and each Deputy Regional Administrator is hereby:

1. Designated to administer the oath of office required by 5 U.S.C. 3331 incident to entrance into the executive branch, or any other oath required by law in connection with employment in the executive branch, as authorized under 5 U.S.C. 2903(b).

2. Authorized to:

a. Designate in writing subordinate employees by position to administer oaths as authorized under 5 U.S.C. 2903 (b); and

b. Redelegate to subordinate employees the authority to designate in writing suborindate employees by position to administer oaths as authorized under 5 U.S.C. 2903(b).

Sec. B. *Supersedure.* This designation and redelegation supersedes unpublished designation and redelegation effective May 19, 1967.

(Sec. 7(d), Department of HUD Act, 42 U.S.C. 3535(d))

Effective date. This designation and redelegation shall be effective October 15, 1972.

Harry T. Morley,
Assistant Secretary for Administration.

[FR Doc.72-17725 Filed 10-17-72;8:47 am]

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

[FRA-Pet-No. 61]

SANDERSVILLE RAILROAD CO.

Notice of Petition for Hours of Service Exemption

October 12, 1972.

The Sandersville Railroad Co. has petitioned the Federal Railroad Administration pursuant to 45 U.S.C. 64a(e) for an exemption, with respect to certain employees, from the Hours of Service Act, 45 U.S.C. secs. 61, 62, 63, and 64.

Interested persons are invited to participate by submitting written data, views, or comments. Communications should identify the docket number and should be submitted in triplicate to Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, Attention: Docket FRA-Pet-No. 61, 400 Seventh Street SW., Washington, DC 20590. Communications received before November 13, 1972, will be considered by the Federal Railroad Administrator before taking final action. All comments received will be available for examination by interested persons at any time during regular working hours in Room 5428, Nassif Building, 400 Seventh Street SW., Washington, DC.

Edward F. Conway, Jr.,
Acting Assistant Chief Counsel for Safety Regulation.

[FR Doc.72-17732 Filed 10-17-72;8:48 am]

[FRA-Pet-No. 62]

MANUFACTURERS' JUNCTION RAILWAY CO.

Notice of Petition for Hours of Service Exemption

October 12, 1972.

The Manufacturers' Junction Railway Co. has petitioned the Federal Railroad Administration pursuant to 45 U.S.C. 64a(e) for an exemption, with respect to certain employees, from the Hours of Service Act, 45 U.S.C. secs. 61, 62, 63, and 64.

Interested persons are invited to participate by submitting written data, views, or comments. Communications should identify the docket number and should be submitted in triplicate to Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, Attention: Docket FRA-Pet-No. 62, 400 Seventh Street SW., Washington, DC 20590. Communications received before November 13, 1972, will be considered by the Federal Railroad Administrator before taking final action. All comments received will be available for examination by interested persons at any time during regular working hours in Room 5428, Nassif Building, 400 Seventh Street SW., Washington, DC.

EDWARD F. CONWAY, Jr.,
Acting Assistant Chief Counsel for Safety Regulation.

[FR Doc.72-17733 Filed 10-17-72;8:48 am]

ATOMIC ENERGY COMMISSION

[Docket No. 50-312]

SACRAMENTO MUNICIPAL UTILITY DISTRICT

Notice of Consideration of Issuance of Facility License and Notice of Opportunity for Hearing

The Atomic Energy Commission (the Commission) will consider the issuance of a facility operating license to the Sacramento Municipal Utility District (the applicant), which would authorize the applicant to possess, use, and operate the Rancho Seco Nuclear Generating Station, Unit 1, a pressurized water nuclear reactor (the facility), located on the applicant's site in southeast Sacramento County, Calif., at steady-state power levels not to exceed 2,772 megawatts thermal in accordance with the provisions of the license and the technical specifications appended thereto, upon the receipt of a report on the applicant's application for a facility operating license by the Advisory Committee on Reactor Safeguards, the submission of a favorable safety evaluation on the application by the Commission's Directorate of Licensing, the completion of the environmental review required by the Commission's regulations in 10 CFR Part 50, Appendix D, and a finding by the Commission that the application for the facility license, as amended, complies with the requirements of the Atomic Energy Act of 1954, as amended (Act), and the Commission's regulations in 10 CFR Chapter 1. Construction of the facility was authorized by Construction Permit No. CPPR-56, issued by the Commission on October 11, 1968.

Prior to issuance of any operating license, the Commission will inspect the facility to determine whether it has been constructed in accordance with the application, as amended, and the provisions of Construction Permit No. CPPR-56. In addition, the license will not be issued until the Commission has made the findings, reflecting its review of the application under the Act which will be set forth in the proposed license, and has concluded that the issuance of the license will not be inimical to the common defense and security or to the health and safety of the public. Upon issuance of the license, the applicant will be required to execute an indemnity agreement as required by section 170 of the Act and 10 CFR Part 140 of the Commission's regulations.

The facility is subject to the provisions of 10 CFR Part 50, Appendix D, section C.3, which sets forth procedures applicable to review of environmental considerations for production and utilization facilities for which construction permits were issued prior to January 1, 1970.

Within thirty (30) days from the date of publication of this notice in the FEDERAL REGISTER, the applicant may file a request for a hearing and any person whose interest may be affected by this proceeding may file a petition for leave to intervene with respect to the issuance of the facility operating license. Requests for a hearing and petitions for leave to intervene shall be filed in accordance with the Commission's rules of practice in 10 CFR Part 2. If a request for a hearing or petition for leave to intervene is filed within the time prescribed in this notice, the Commission will issue a notice of hearing or an appropriate order.

A petition for leave to intervene must be filed under oath or affirmation in accordance with the provisions of 10 CFR 2.714. As required by 10 CFR 2.714, a petition for leave to intervene shall set forth the interest of the petitioner in the proceeding, how that interest may be affected by the results of the proceeding, and any other contentions of the petitioner including the facts and reasons why he should be permitted to intervene, with particular reference to the following factors: (1) The nature of the petitioner's right under the Act to be made a party to the proceeding; (2) the nature and extent of the petitioner's property, financial, or other interest in the proceeding; and (3) the possible effect of any order which may be entered in the proceeding on the petitioner's interest. Any such petition shall be accompanied by a supporting affidavit identifying the specific aspect or aspects of the subject matter of the proceeding at to which the petitioner wishes to intervene and setting forth with particularity both the facts pertaining to his interest and the basis for his contentions with regard to each aspect on which he desires to intervene. A petition that sets forth contentions relating only to matters outside the jurisdiction of the Commission will be denied.

A request for a hearing or a petition for leave to intervene must be filed with the Office of the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff, or the Commission's Public Document Room, 1717 H Street NW., Washington, DC, not later than thirty (30) days from the date of publication of this notice in the FEDERAL REGISTER. A petition for leave to intervene which is not timely will not be granted unless the Commission determines that the petitioner has made a substantial showing of good cause for failure to file on time and after the Commission has considered those factors specified in 10 CFR 2.714(a).

For further details pertinent to the matters under consideration, see the application for the facility operating license, dated April 14, 1971, as amended, and the Applicant's Environmental Report, dated May 18, 1971, and supplements thereto, which are available for public inspection at the Commission's Public Document Room, 1717 H Street NW., Washington, DC, and at the Sacramento City County Library, 828 I Street, Sacramento, CA 95814. As they become available, the following documents also will be available at the above locations: (1) The report of the Advisory Committee on Reactor Safeguards on the application for facility operating license; (2) the Commission's draft detailed statement on environmental considerations pursuant to 10 CFR Part 50, Appendix D; (3) the Commission's final detailed statement on environmental considerations; (4) the safety evaluation prepared by the Directorate of Licensing; (5) the proposed facility operating license; and (6) the technical specifications, which will be attached to the proposed facility operating license.

Copies of items (1), (3), (4), and (5) may be obtained by request to the Deputy Director for Reactor Projects, Directorate of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545.

For the Atomic Energy Commission.

Dated at Bethesda, Md., this 6th day of October 1972.

A. GIAMBUSSO,
Deputy Director for Reactor Projects, Directorate of Licensing.

[FR Doc.72-17440 Filed 10-17-72;8:45 am]

[Docket No. RM-50-1]

LIGHT-WATER-COOLED NUCLEAR POWER REACTORS

Acceptance Criteria for Emergency Core Cooling Systems; Resumption of Hearing

According to Board order Postponing Dates for Filing Redirect and Rebuttal Testimony and Areas of Questioning, and Resumption of Hearings filed October 10, 1972, hearing sessions will resume on Tuesday, November 14, 1972, at 9:30 a.m., in Suite 100 at 8120 Woodmont Avenue, Bethesda, MD. These hearing sessions will continue on a daily basis thereafter until questioning sessions are completed.

Issued at Washington, D.C., this 12th day of October 1972.

NATHANIEL H. GOODRICH,
Chairman, Hearing Board, Emergency Core Cooling Systems.

[FR Doc.72-17704 Filed 10-17-72;8:46 am]

CIVIL SERVICE COMMISSION

LOAN AND FINANCIAL EXAMINATION OFFICER

Manpower Shortage; Notice of Listing

Under the provisions of 5 U.S.C. 5723, the Civil Service Commission found a manpower shortage on September 26, 1972, for two positions of Loan and Financial Examination Officer, GS-301-15, Farm Credit Administration, Nationwide.

This finding is self-canceling when these two positions are filled. The Commission also found a manpower shortage, under 5 U.S.C. 5723, for positions of Loan Examiner (Agriculture), GS-1101-9/14, Farm Credit Administration, Nationwide.

Assuming other legal requirements are met, the Administration may pay the expense of travel and transportation to first post of duty for appointees to these positions.

United States Civil Service Commission,
[seal] James C. Spry,
Executive Assistant to the Commissioners.

[FR Doc.72-17730 Filed 10-17-72;8:48 am]

COUNCIL ON ENVIRONMENTAL QUALITY

ADVISORY COMMITTEE ON ADVANCED AUTOMOTIVE POWER SYSTEMS

Notice of Meeting

Pursuant to section 13 of Executive Order 11671 (June 5, 1972), notice is hereby given that a meeting of the Advisory Committee on Advanced Automotive Power Systems will be held on October 23-24, 1972, in Room 153, Chrysler Center for Continuing Education, University of Michigan, North Campus Road, Ann Arbor, Mich. The meeting, which is open to the public, will convene at 9 a.m. on October 23.

The purpose of the Advisory Committee on Advanced Automotive Power Systems is to advise the Council on Environmental Quality with respect to research and development of low-emission, surface-vehicle powered systems as potential alternatives to the internal combustion engine. The agenda for the October 23-24 meeting includes the following:

1. Status report on the Advanced Automotive Power Systems (AAPS) Program of the Environmental Protection Agency.
2. Review of AAPS combustor development projects.
3. Review of AAPS projects on heat engine-electric hybrid power systems.
4. Summary of Transportation Energy Panel report on research and development for fuel economy in automotive propulsion.
5. Status of diesel and Sterling cycle projects.

A list of advisory committee members is available from, and requests for additional information should be made to: Dr. Philip E. Schambra, Council on Environmental Quality, 722 Jackson Place NW., Washington, DC 20006 (202—382-6754).

Timothy Atkeson,
General Counsel.

[FR Doc.72-17812 Filed 10-17-72;8:50 am]

ENVIRONMENTAL IMPACT STATEMENTS

Notice of Availability

Environmental impact statements received by the Council on Environmental Quality October 2 to October 6, 1972.

Note: At the head of the listing of statements received from each agency is the name of an individual who can answer questions regarding those statements.

Department of Agriculture

Contact: Dr. T. C. Byerly, Office of the Secretary, Washington, D.C. 20250, 202—388-7803.

FOREST SERVICE

Draft, October 4

Big Game Habitat Improvement, Idaho. The statement considers the prescribed burning of brushfield and coniferous trees in northern Idaho during (fiscal) 1973-75, for the purpose of providing forage for Rocky Mountain elk and mule deer. The project area includes the drainages of the Spokane, St. Joe, Clearwater, and Salmon Rivers. Adverse impact will result to air, water, soil, and esthetic qualities. (49 pages) (ELR Order No. 05399) (NTIS Order No. EIS 72 5399-D)

Atomic Energy Commission

Contact: For nonregulatory matters: Mr. Robert J. Catlin, Director, Division of Environmental Affairs, Washington, D.C. 20545, 202—973-5391.

For regulatory matters: Mr. A. Giambusso, Deputy Director for Reactor Projects, Directorate of Licensing, Washington, D.C. 20545, 202—973-7373.

Draft, October 4

Virgil G. Summer Nuclear Station, S.C., county: Fairfield. The statement refers to the proposed issuance of a construction permit to the South Carolina Electric & Gas Co. for the station. Unit 1 will employ a pressurized water reactor of 2,775 MWt to produce 900 MWe (net); "stretch" levels of 2,914 MWt and 950 MWe are anticipated. A 6,800-acre lake will be constructed by the applicant in order to provide cooling water for the station. Small quantities of radioactive material will be released to the environs. (A Federal Power Commission impact statement, FPC No. 1894, refers to South Carolina Electric's Fairfield Pumped Storage Hydrostation. The two statements together will cover the overall impact of the project.) (230 pages) (ELR Order No. 05394) (NTIS Order No. EIS 72 5394-D)

Final, October 4

Indian Point Generating Plant. The statement refers to the proposed issuance of an operating license to the Consolidated Edison Co. of New York, Inc., for Unit 2 of the three-unit plant. The unit will employ a pressurized water reactor of 873 MWe. A total of 2,600 c.f.s. of water for once-through cooling and service systems will be drawn from the Hudson River and discharged at 15° F. above ambient. The dissolved oxygen concentration in discharge water will be reduced to levels which may be harmful to aquatic life. The impacts of the cooling system intake structure, thermal discharge, and chemical (including chlorine) discharge, will adversely affect aquatic life in the New York, New Jersey, and New England regions. (2 volumes). Comments made by: USDA, COE, DOC, EPA, FPC, HEW, DOI, DOT, State, and local agencies and concerned citizens. (ELR Order No. 05400) (NTIS Order No. EIS 72 5400-F)

Arkansas Nuclear One Unit 2, Ark., county: Pope. The statement considers the issuance of a construction permit to the Arkansas Power & Light Co. for Unit 2, a 2,760 MWt, 950 MWe pressurized water reactor, with anticipated future power levels of 2,900 MWt and 974 MWe. Water for the closed cycle cooling system (with a natural-draft tower) will be drawn from the Illinois Bayou of the Dardanelle Reservoir. Fish may be entrapped on the cooling system inlet. Radioactivity released from the Unit will include 4,350 curies of gaseous effluents and 1,005 curies of liquid effluents (including 1,000 of tritium), annually. (294 pages) Comments made by: USDA, COE, DOC, EPA, FPC, HEW, HUD, DOI, and DOT. (ELR Order No. 05393) (NTIS Order No. EIS 72 5393-F)

Final, October 6

Shoreham Nuclear Power Station, N.Y., county: Suffolk. The statement refers to the proposed issuance of a construction permit to the Long Island Lighting Co. A single boiling water reactor, of 2,436 MWt and 820 MWe (net) capacity will be installed. Cooling water will be drawn from and discharged to Long Island Sound, at 14° above ambient. Marine organisms may become impinged upon intake apparatus; radioactive gaseous and liquid effluents will be released to the environment. (580 pages) Comments made by: USDA, COE, DOC, HEW, DOT, EPA, and FPC. (ELR Order No. 05423) (NTIS Order No. EIS 72 5423-F)

Department of Commerce

Contact: Dr. Sidney R. Galler, Deputy Assistant Secretary for Environmental Affairs, Department of Commerce, Washington, D.C. 20230, 202—967-4335.

Draft, October 2

Marine Resource Facility, N.C., county: Carteret. The proposed project involves the construction of a single building, parking lots, an access road, a pier and boat basin, a septic system, and related facilities. Several acres of maritime forest will be committed to the action. (25 pages) (ELR Order No. 05381) (NTIS Order No. EIS 72 5381-D)

Final, October 4

Artificial Reefs, Cape Henry, Va. The statement refers to the proposed creation of two artificial reefs, of 80 and 400 acres, which would be constructed 15 and 30 miles east of Cape Henry by the sinking of 166 surplus Navy landing craft and barges. The purposes of the project are those of creating a habitat attractive to sport fishes and of providing research on the benefits of artificial reefs. Benthic fauna will be damaged at the two sites. (27 pages) Comments made by: COE, USN, and DOI. (ELR Order No. 05392) (NTIS Order No. EIS 72 5392-F)

Department of Defense

ARMY CORPS

Contact: Mr. Francis X. Kelly, Director, Office of Public Affairs, Attention: DAEN-PAP, Office of the Chief of Engineers, U.S. Army Corps of Engineers, 1000 Independence Avenue SW., Washington, DC 20314, 202—693-7168.

Draft, October 6

Petit Anse, Tigre, and Carlin Bayous, La. The statement refers to the proposed replacement of a railroad bridge and the enlargement of Bayou Carlin and Bayou Petit Anse in order to reduce navigation hazards. Approximately 1,200,000 cubic yards of spoil will be dredged and deposited on a 2,900-acre area (400 acres of which is agricultural-pastureland and 500 of which is marsh). (73 pages) (ELR Order No. 05422) (NTIS Order No. EIS 72 5422-D)

Federal Power Commission

Contact: Mr. Frederick H. Warren, Advisor on Environmental Quality, 441 G Street NW., Washington, DC 20426, 202—386-6084.

Draft, October 6

Grace-Cove Project No. 2401, Idaho County: Caribou. The statement refers to the proposed approval of an application by the Utah Power and Light Co. for the 44,000 kw. hydroelectric power project. The statement mentions no significant adverse impacts. (9 pages) (ELR Order No. 05407) (NTIS Order No. EIS 72 5407-D)

Molly's Falls Project No. 2439, Vermont County: Washington, Caledonia. The statement considers an application by the Green Mountain Power Corp. for a major license for the 5,000 kw. hydroelectric power project. The statement indicates that no adverse environmental impact will result from the action. (25 pages) (ELR Order No. 05429) (NTIS Order No. EIS 72 5429-D)

Department of State

Contact: Mr. Christian Herter, Jr., Special Assistant to the Secretary for Environmental Affairs, Room 7819, Washington, D.C. 20520, 202—632-7964.

Draft, September 29

Proposed Ocean Dumping Convention. The statement refers to the proposed signature and ratification of the draft Convention for the Prevention of Marine Pollution by Dumping, which was produced by the Intergovernmental Meeting on Ocean Dumping at Reykjavik, Iceland, and amended at the Intergovernmental Meeting on Ocean Dumping at London. The Convention would prohibit all deliberate disposal at sea, from vessels and aircraft, of certain dangerous substances, and require permits for the dumping of other substances in accordance with detailed criteria. (91 pages) (ELR Order No. 05377) (NTIS Order No. EIS 72 5377-D)

Draft, October 4

Dome Pipeline Corp. Permit. The statement refers to an amendment to a permit held by the Dome Pipeline Corp. which would authorize the transmittal of oil through an existing pipeline segment that crosses under the Detroit River between Windsor, Ontario, and Detroit, Mich. The section is part of a 110-mile long pipe which will run from storage facilities in Windsor to a natural gas reforming plant now being built in Green Springs, Ohio. (27 pages) (ELR Order No. 05398) (NTIS Order No. EIS 72 5398-D)

Tennessee Valley Authority

Contact: Dr. Francis Gartrell, Director of Environmental Research and Development, 720 Edney Building, Chatanooga, Tenn. 37401, 615—755-2002.

Final, October 4

Control of Eurasian Watermilfoil. The statement refers to the proposed continued use of water level management and the herbicide 2, 4-D in an annual program which is intended to control the growth of Eurasian Watermilfoil (Myriophyllum spicatum L.) in the TVA reservoir system. Adverse effects will include the possibility of low concentrations of herbicides in water supplies, damage to nontarget aquatic and terrestial plants, and the loss of food and shelter for fish and waterfowl populations. (92 pages) Comments made by: USDA, DOC, COE, HEW, DOI, EPA. State, local, and regional agencies (ELR Order No. 05397) (NTIS Order No. EIS 72 5397-F)

Department of Transportation

Contact: Mr. Martin Convisser, Director, Office of Environmental Quality, 400 Seventh Street SW., Washington, DC 20590, 202—426-4355.

FEDERAL AVIATION AGENCY

Draft, October 4

Marshall Airport, Mo., County: Saline. The statement refers to the proposed widening and lengthening of a runway from its present 50′ x 3,500′ to 75′ x 3,900′, the relocation of lighting and the installation of VASI. Air and noise pollution levels will increase. (23 pages) (ELR Order No. 05390) (NTIS Order No. EIS 72 5390-D)

Columbus Airport, Nebr., County: Platte. The statement refers to the proposed acquisition of 187 acres of land for the future extension of runways and instrumentation of the airport. Two residences would be displaced by the action. (28 pages) (ELR Order No. 05391) (NTIS Order No. EIS 72 5391-D)

Tri-State Airport, W. Va., County: Wayne. The statement refers to the proposed construction of a new 3,000′ x 60′ lighted runway. The new facility will generate new traffic, with a concomitant increase in noise. (22 pages) (ELR Order No. 05389) (NTIS Order No. EIS 72 5389-D)

Federal Highway Administration

Draft, October 6

Coosa River Bridge, Ala., County: Etowah. The statement considers the proposed construction of a bridge across the Coosa River between Southside and Rainbow City. The project provides an additional bridge for southbound traffic and retains the existing bridge for northbound traffic. Approximately 32 acres of land are required for right-of-way. Three families and one combination residence and business will be displaced. (20 pages) (ELR Order No. 05409) (NTIS Order No. EIS 72 5409-D)

Kirby Avenue (FAU Route 8320), Illinois, County: Champaign. The proposed project is the reconstruction of two-lane Kirby Avenue to four-lanes. All construction will be done on existing right-of-way. Construction easements required throughout the project include a temporary easement of 4(f) land from the Champaign Park District. (29 pages) (ELR Order No. 05408) (NTIS Order No. EIS 72 5408-D)

Draft, October 2

Kentucky 237, Kentucky, County: Boone. The proposed project is the relocation and reconstruction of Kentucky 237 to a four-lane facility. Length of project is 2.69 miles. The number of family and business dislocations will depend upon the route selected. Wildlife will be affected. (4 pages) (ELR Order No. 05383) (NTIS Order No. EIS 72 5383-D)

U.S. 6 and U.S. 34, Nebraska, County: Furnas, Harlan, and Phelps. The proposed project entails the reconstruction of a segment of U.S. highways 6 and 34. Project length, amount of land acquisition and number of family and business displacements will depend upon the route chosen; each would have adverse effects on wildlife and farming and livestock operations. Land erosion and water pollution will occur. (21 pages) (ELR Order No. 05384) (NTIS Order No. EIS 72 5384-D)

New Hampshire Route 111, New Hampshire, County: Rockingham. The proposed project is the relocation of New Hampshire Route 111. Project length is approximately 6 miles. Displacements include 14 families and 8 businesses. The relocated road will be constructed through agricultural and residential areas. One historical site and wildlife in nearby wetlands will be affected. Increases of noise and soil siltation are expected. (45 pages) (ELR Order No. 05385) (NTIS Order No. EIS 72 5385-D)

Draft, October 6

I-79, West Virginia, County: Kanawha. The statement contains a location study for construction of a portion of I-79 beginning near Charleston and ending near the community of Big Chimmey. The number of families and businesses displaced will depend upon the alternate selected. Adverse impacts include increases in air, noise and water pollution and temporary erosion and siltation during construction. (138 pages) (ELR Order No. 05410) (NTIS Order No. EIS 72 5410-D)

Final, October 6

Illinois Route 4 (F.A.P. Route 68), Illinois, County: Madison. The proposed project involves the relocation of existing F.A.P. Route 68 in the vicinity of its crossing over U.S. 40. Three bridges will be reconstructed. Project length is approximately 1 mile. Thirty acres are required for right-of-way. (102 pages) Comments made by: USDA, DOC, COE, HEW, DOI, and DOT (ELR Order No. 05419) (NTIS Order No. EIS 72 5419-F)

U.S. 36, Kansas, County: Brown. The statement refers to a corridor study for the relocation of approximately 13 miles of U.S. 36. Acquisition of right-of-way will reduce the amount of land available for agricultural and wildlife use. Some properties will be severed and an unspecified number of residences displaced. (177 pages) Comments made by: USDA, COE, EPA, HEW, HUD, and DOI (ELR Order No. 05418) (NTIS Order No. EIS 72 5418-F)

U.S. 287, Texas, County: Ellis. The statement considers a proposal to construct a four-lane divided highway along the existing alignment of two-lane U.S. 287. Approximately 200 acres of agricultural land will be committed to right-of-way. Six families will be displaced, several businesses will be either bypassed or encroached upon. (57 pages) Comments made by: USDA, COE, EPA, HEW, and HUD (ELR Order No. 05412) (NTIS Order No. EIS 72 5412-F)

Final, October 4

Groton-Marshfield State Highway, Vermont, County: Caledonia. The statement considers a proposal to relocate 1,900 feet of the Groton-Marshfield State Highway. The purpose of the project is to eliminate two sharp curves. A section 4(f) statement has been filed for the 0.5-acre impingement on the Groton State Forest. (53 pages) Comments made by: EPA and DOT (ELR Order No. 05396) (NTIS Order No. EIS 72 5396–F)

U.S. 16, Wisconsin, County: Waukesha. The statement refers to a proposal to widen existing U.S. 16 from a two-lane highway to a four-lane freeway between the communities of Oconomowoc and Pewaukee. Project length is 11.9 miles. Approximately 296 acres are required for additional right-of-way. Six businesses, 40 fixed homes and 45 mobile homes may be displaced. (429 pages) Comments made by: USDA, EPA, HEW, HUD, DOT, and DOT State, regional, and local agencies (ELR Order No. 05401) (NTIS Order No. EIS 72 5401–F)

URBAN MASS TRANSPORTATION ADMINISTRATION

Final, October 2

Baltimore Region Rapid Transit System, Maryland County: Baltimore. The statement considers an application by the Maryland Department of Transportation for a grant of two-thirds of the cost of the final design, construction, and land acquisition of a rail rapid transit line for Section A of Phase 1 of the System. Total cost of Phase 1 is $404,513,000. The section discussed in the statement includes 8.5 miles of double-track line and 10 stations. Approximately 46 families and 32 businesses will be displaced by the project. (96 pages) Comments made by: USDA, DOC, EPA, and DOI (ELR Order No. 05387) (NTIS Order No. EIS 72 5387–F)

BRIAN P. JENNY,
Acting General Counsel.

[FR Doc.72–17757 Filed 10–17–72;8:50 am]

ENVIRONMENTAL PROTECTION AGENCY

DOW CHEMICAL CO.

Filing of Petition Regarding Pesticide Chemicals

Pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 408 (d)(1), 68 Stat. 512; 21 U.S.C. 346a(d)(1)), notice is given that a petition (PP 3F1313) has been filed by the Dow Chemical Co., Post Office Box 1706, Midland, MI 48640, proposing establishment of tolerances (40 CFR Part 180) for residues of the herbicide dalapon (2,2-dichloropropionic acid) from application of dalapon sodium salt or dalapon sodium-magnesium salt mixtures in or on the raw agricultural commodities almond hulls at 50 parts per milion; almonds and pasture and range grass at 10 parts per million; lemons, plums (fresh prunes), and walnuts at 5 parts per million; and pecans at 0.1 part per million.

The analytical method proposed in the petition for determining residues of the herbicide is a gas chromatographic procedure with electron-capture detection.

Dated: October 10, 1972.

EDWIN L. JOHNSON,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72–17709 Filed 10–17–72;8:46 am]

DOW CHEMICAL CO. AND M. & T. CHEMICALS, INC.

Notice of Filing of Pesticide and Food Additive Petitions

Pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (secs. 408 (d)(1), 409(b)(5), 68 Stat. 512; 72 Stat. 1786; 21 U.S.C. 346a(d)(1), 348(b)(5)), notice is given that a pesticide petition (PP 3F1312) has been filed jointly by The Dow Chemical Co., Post Office Box 1706, Midland, MI 48640 and M. & T. Chemicals, Inc., Post Office Box 1104, Rahway, NJ 07065, proposing establishment of a tolerance (CFR Part 180) for combined residues of the insecticide tricyclohexyltin hydroxide and its organotin metabolites (calculated as tricyclohexyltin hydroxide) in or on the raw agricultural commodity citrus at 2 parts per million.

Notice is also given that the same firms have filed a related food additive petition (FAP 3H5021) proposing establishment of a food additive tolerance (21 CFR Part 121) of 8 parts per million for residues of tricyclohexyltin hydroxide including its organotin metabolites (calculated as tricyclohexyltin hydroxide) in citrus pulp resulting from application of the insecticide to growing citrus fruit.

The analytical method proposed in the pesticide petition for determining residues of the insecticide is a procedure where the organotin compounds are converted to an inorganic form measurable by the dithiol colorimetric method at 530 nanometers.

Dated: October 6, 1972.

EDWIN L. JOHNSON,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72–17708 Filed 10–17–72;8:46 am]

E. I. DU PONT DE NEMOURS & CO., INC.

Notice of Filing of Petition Regarding Pesticide Chemical

Correction

In F.R. Doc. 72–17184, appearing at page 21363, in the issue of Saturday, October 7, 1972, in the seventh line of the second paragraph, the third word now reading "utilities", should read "utilizes".

FMC CORP.

Filing of Petition Regarding Pesticide Chemicals

Pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 408 (d)(1), 68 Stat. 512; 21 U.S.C. 346a(d)(1)), notice is given that a petition (PP 3F1314) has been filed by FMC Corp., 100 Niagara Street, Middleport, NY 14105, proposing establishment of tolerances (40 CFR Part 180) for combined residues of the insecticide endosulfan (6,7,8,9,10,10 - hexachloro - 1,5,5a,6,9,9a-hexahydro - 6,9 - methano - 2,4,3 - benzodioxathiepin-3-oxide) and its metabolite endosulfan sulfate in or on the raw agricultural commodities almond hulls at 1 part per million and almonds at 0.2 part per million (negligible residue).

The analytical method proposed in the petition for determining residues of the insecticide is a microcoulometric gas chromatographic procedure for chlorine.

Dated: October 6, 1972.

EDWIN L. JOHNSON,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72–17710 Filed 10–17–72;8:46 am]

UNIROYAL CHEMICAL

Filing of Petition Regarding Pesticide Chemical

Pursuant to provisions of the Federal Food, Drug, and Cosmetic Act (sec. 408 (d)(1), 68 Stat. 512; 21 U.S.C. 346a(d)(1)), notice is given that a petition (PP 3F1311) has been filed by Uniroyal Chemical, Division of Uniroyal, Inc., Elm Street, Naugatuck, Conn. 06770, proposing establishment of a tolerance (40 CFR Part 180) for residues of the herbicide CIPC (isopropyl N - (3 - chlorophenyl) carbamate) in or on the raw agricultural commodity soybeans at 0.3 part per million.

The analytical method proposed in the petition for determining residues of the herbicide is a procedure using gas-liquid chromatography with nitrogen detection.

Dated: October 6, 1972.

EDWIN L. JOHNSON,
Acting Deputy Assistant Administrator for Pesticides Programs.

[FR Doc.72–17711 Filed 10–17–72;8:46 am]

ENVIRONMENTAL IMPACT STATEMENTS

Availability of Agency Comments

Appendix I contains a listing of draft environmental impact statements which the Environmental Protection Agency (EPA) has reviewed and commented upon in writing during the period from September 16, 1972, to September 30, 1972, as required by section 102(2)(C) of the National Environmental Policy Act of 1969 and section 309 of the Clean Air Act, as amended. The listing includes the Federal agency responsible for the statement, the number assigned by EPA to the statement, the title of the statement, the classification of the nature of EPA's comments, and the source for copies of the comments.

Appendix II contains definitions of the four classifications of EPA's comments. Copies of EPA's comments on these draft environmental impact statements are available to the public from the EPA offices noted.

Appendix III contains a listing of the addresses of the sources for copies of EPA comments listed in Appendix I.

Copies of the draft environmental impact statements are available from the Federal department or agency which prepared the draft statement or from the National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151.

Dated: October 10, 1972.

Sheldon Meyers,
Director,
Office of Federal Activities.

APPENDIX I.—ENVIRONMENTAL IMPACT STATEMENTS FOR WHICH COMMENTS WERE ISSUED BETWEEN SEPTEMBER 16, 1972, AND SEPTEMBER 30, 1972

Responsible Federal Agency	Title and identifying number	General nature of comments	Source for copies of comments
Atomic energy commission	D-AEC-00066-27: LaSalle County Nuclear Power Stations, Units 1 and 2, Ill.	2	A
Do.	D-AEC-00063-26: Kewaunee Nuclear Power Plant, Wis.	2	A
Corps of Engineers	D-COE-35042-07: Permit for dam on Murderers Creek, Greene County, N.Y.	3	C
Do.	D-COE-25025-07: Application for discharge permit by Con Ed Co., New York.	2	C
Do.	D-COE-35040-15: Maintenance dredging of Hampton Creek, Va., Westmoreland County, Pa.	2	D
Do.	D-COE-89102-00: Construction of mooring facilities, Ohio River Navigation system.	2	E
Do.	D-COE-32368-20: American Cyanamid Co., Savannah Harbor, Chatham County, Ga.	3	E
Department of Agriculture	D-DOA-01019-14: Approval of operating plans for development of coal mines on Shavers Fork of Cheat River, W. Va.	3	D
Do.	D-DOA-36150-28: Fall Creek Watershed, Warren County, Ind.	2	F
Department of Commerce	D-DOC-89105-15: Artificial reef construction, Cape Henry, Va	1	D
Department of the Interior	D-DOI-02040-35: Proposed Outer Continental Shelf Oil and Gas Lease Sale, Louisiana.	2	A
Do.	D-DOI-07067-42: Second Watertown Brookings 115 kv. line, South Dakota.	1	I
Department of Transportation	D-DOT-41418-05: Route 10, Hamden to North Haven, Conn.	2	B
Do.	D-DOT-41490-07: New bridge over Susquehanna River, Binghamton, Broome County, N.Y.	2	C
Do.	D-DOT-41461-14: U.S. Route 30—Chester to Pennsylvania State line, West Virginia.	1	D
Do.	D-DOT-41468-16: I-695, District of Columbia, Lincoln Memorial to Washington Monument, Washington, D.C.	2	D
Do.	D-DOT-41450-21: Indian River County connecting road, Florida.	2	E
Do.	D-DOT-41439-22: Completion of I-40 through Memphis, Tenn.	2	E
Do.	D-DOT-41407-27: FA Route 402, Whiteside County, Ill.	2	F
Do.	D-DOT-41416-30: TH 87, Becker County, Minn.	1	F
Do.	D-DOT-41441-34: Southwest Freeway, FR I-35W to Tarrant-Johnson County line, Tex.	2	G
Do.	D-DOT-51185-39: Springfield Municipal Airport, Green County, Mo.	1	H
Do.	D-DOT-41456-39: Route 40, TR St. Louis, Mo.	2	H
Do.	D-DOT-41455-38: (SF) 69-61 F 083-2(11) and (18) Miami County, Kans.	2	H
Do.	D-DOT-41445-36: S-406(6) Brule—South, Keith County, Nebr.	2	H
Do.	D-DOT-41186-36: Seward Municipal Airport, Nebr.	2	H
Do.	D-DOT-41430-38: K-4, Jefferson County, Kans.	1	H
Do.	D-DOT-52028-45: Los Animas County Airport, Colo.	2	I
Do.	D-DOT-41379-44: Highway Projects I-215 and I-80, Interchange, Salt Lake City, Utah.	1	I
Do.	D-DOT-41417-48: Improvements to U.S. 80, Yuma, Ariz.	1	J
Federal Power Commission	D-FPC-03028-08: Tecon Gasification Plant, South Plainfield, N.J.	1	C
Do.	D-FPC-05408-22: Martin Project No. 349, Tallapoosa River Ala.	2	E
Do.	D-FPC-05390-44: Application of relicensing, Weber Project No. 1744, Utah.	1	I
Department of Health, Education, and Welfare.	D-HEW-81094-27: Grant Hospital, Cook County, Ill.	1	F
Department of Housing and Urban Development.	D-HUD-81101-34: Bergstrom Arms Apr., Austin, Tex.	1	G
Department of the Treasury	D-TRE-10022-12: Proposed facilities for the Consolidated Federal Law Enforcement Training, Maryland.	2	D
Do.	D-TRE-80199-45: Proposed new Denver Mint, Colorado.	1	I
Tennessee Valley Authority	D-TVA-25024-22: Experimental SO_2 removal system and waste disposal pond, Widows Creek Steam Plant, Jackson County, Ala.	1	E

APPENDIX II

DEFINITION OF CODES FOR THE GENERAL NATURE OF EPA COMMENTS

(1) *General agreement/lack of objections:* The Agency generally:

(a) Has no objections to the proposed action as described in the draft impact statement;

(b) Suggests only minor changes in the proposed action or the draft impact statement; or

(c) Has no comments on the draft impact statement or the proposed action.

(2) *Inadequate information:* The Agency feels that the draft impact statement does not contain adequate information to assess fully the environmental impact of the proposed action. The Agency's comments call for more information about the potential environmental hazards addressed in the statement, or ask that a potential environmental hazard be addressed since it was not addressed in the draft statement.

(3) *Major changes necessary:* The Agency believes that the proposed action, as described in the draft impact statement, needs major revisions or major additional safeguards to adequately protect the environment.

(4) *Unsatisfactory:* The Agency believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the safeguards which might be utilized may not adequately protect the environment from the hazards arising from this action. The Agency therefore recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

APPENDIX III

SOURCES FOR COPIES OF EPA COMMENTS

A. Director, Office of Public Affairs, Environmental Protection Agency, 401 M Street SW., Washington, DC 20460.

B. Director of Public Affairs, Region I, Environmental Protection Agency, Room 2303, John F. Kennedy Federal Building, Boston, Mass. 02203.

C. Director of Public Affairs, Region II, Environmental Protection Agency, Room 847, 26 Federal Plaza, New York, NY 10007.

D. Director of Public Affairs, Region III, Environmental Protection Agency, Curtis Building, Sixth and Walnut Streets, Philadelphia, Pa. 19106.

E. Director of Public Affairs, Region IV, Environmental Protection Agency, Suite 300, 1421 Peachtree Street NE., Atlanta, GA 30309.

F. Director of Public Affairs, Region V, Environmental Protection Agency, 1 North Wacker Drive, Chicago, IL 60606.

G. Director of Public Affairs, Region VI, Environmental Protection Agency, 1600 Patterson Street, Dallas, TX 75201.

H. Director of Public Affairs, Region VII, Environmental Protection Agency, 1735 Baltimore Street, Kansas City, MO 64108.

I. Director of Public Affairs, Region VIII, Environmental Protection Agency, Lincoln Tower, Room 916, 1860 Lincoln Street, Denver, CO 80203.

J. Director of Public Affairs, Region IX, Environmental Protection Agency, 100 California Street, San Francisco, CA 94102.

K. Director of Public Affairs, Region X, Environmental Protection Agency, 1200 Sixth Avenue, Seattle, WA 98101.

[FR Doc.72-17734 Filed 10-17-72;8:50 am]

NATIONAL AMBIENT AIR QUALITY STANDARDS

Proposed State Implementation Plans; Notice of Public Hearing

On July 27, 1972 (37 F.R. 15094), the Administrator published proposed regulations to correct certain deficiencies in State plans for implementation of national ambient air quality standards. Pursuant to a notice published on August 18, 1972 (37 F.R. 16694), a public hearing was held on the proposed regulations in Utah on September 14, 1972.

On September 16, 1972 (37 F.R. 18944), notice was published to reconvene the hearing on October 27, 1972. Such hearing will be postponed to reconvene instead on November 9, 1972, at 9 a.m., State Office Building, Highway Auditorium, Salt Lake City. The Hearing Officer will be Mr. Leonard W. D. Campbell.

Persons wishing to participate in these public hearings should signify their intentions by notifying the hearing officer, and, where practicable, supplying five copies of their statements 5 days in advance of the hearing date. Written statements may also be submitted for the record of the hearing. Notifications and copies of statements should be addressed to:

Environmental Protection Agency, Hearing Officer, Regional Counsel, 1860 Lincoln Street, Suite 900, Denver, CO 80203.

Copies of the proposed regulations which will be considered at these public hearings are available from the Agency's Regional Office at the following address:

Environmental Protection Agency, Air and Water Programs Division, 1860 Lincoln Street, Suite 900, Denver, CO 80203.

Dated: October 13, 1972.

William D. Ruckelshaus,
Administrator.

[FR Doc.72-17729 Filed 10-17-72;8:48 am]

FEDERAL DEPOSIT INSURANCE CORPORATION

INSURED BANKS

Joint Call for Report of Condition

Pursuant to the provisions of section 7(a)(3) of the Federal Deposit Insurance Act, each insured bank is required to make a report of condition as of the close of business October 10, 1972, to the appropriate agency designated herein, within 10 days after notice that such report shall be made: *Provided*, That if such reporting date is a nonbusiness day for any bank, the preceding business day shall be its reporting date.

Each national bank and each bank in the District of Columbia shall make its original report of condition on Office of the Comptroller Form CC-8022-05 (Call No. 483),[1] and shall send the same to the Comptroller of the Currency and shall send a signed and attested copy thereof to the Federal Deposit Insurance Corporation. Each insured State bank which is a member of the Federal Reserve System, except a bank in the District of Columbia, shall make its original report of condition on Federal Reserve Form F.R. 105 (Call 205)[1] and shall send the same to the Federal Reserve Bank of the District wherein the bank is located and shall send a signed and attested copy thereof to the Federal Deposit Insurance Corporation. Each insured State bank not a member of the Federal Reserve System, except a bank in the District of Columbia and a mutual savings bank, shall make its original report of condition on FDIC Form 64 (Call No. 101)[1] and shall send the same to the Federal Deposit Insurance Corporation.

The original report of condition required to be furnished hereunder to the Comptroller of the Currency and the copy thereof required to be furnished to the Federal Deposit Insurance Corporation shall be prepared in accordance with "Instructions for Preparation of Consolidated Reports of Condition by National Banking Associations," as amended.[1] The original report of condition required to be furnished hereunder to the Federal Reserve Bank of the District wherein the bank is located and the copy thereof required to be furnished to the Federal Deposit Insurance Corporation shall be prepared in accordance with "Instructions for the Preparation of Reports of Condition by State Member Banks of the Federal Reserve System," as amended.[1] The original report of condition required to be furnished hereunder to the Federal Deposit Insurance Corporation shall be prepared in accordance with "Instructions for the Preparation of Report of Condition on Form 64 by Insured State Banks Not Members of the Federal Reserve System," as amended.[1]

Each insured mutual savings bank not a member of the Federal Reserve System shall make its original report of condition on FDIC Form 64 (Savings),[1] prepared in accordance with "Instructions for the Preparation of Report of Condition on Form 64 (Savings), and Report of Income on Form 73 (Savings) by Insured Mutual Savings Banks," as amended,[1] and shall send the same to the Federal Deposit Insurance Corporation.

[SEAL] Frank Wille,
Chairman, Federal Deposit Insurance Corporation.

William B. Camp,
Comptroller of the Currency.

J. L. Robertson,
Vice Chairman, Board of Governors of the Federal Reserve System.

[FR Doc.72-17717 Filed 10-17-72;8:48 am]

---

[1] Filed as part of original document.

FEDERAL MARITIME COMMISSION

[Docket No. 72-51]

NEW YORK SHIPPING ASSOCIATION

Enlargement of Time To File Replies

Docket No. 72-51, New York Shipping Association—NYSA-ILA man-hour/tonnage method of assessment; possible violation of sections 15, 16, and 17, Shipping Act, 1916.

Upon request of counsel for Wallenius Line, and good cause appearing, time within which replies to respondents affidavits and memoranda may be filed in this proceeding is enlarged to and including October 30, 1972.

By the Commission.

[SEAL] Francis C. Hurney,
Secretary.

[FR Doc.72-17701 Filed 10-17-72;8:45 am]

FEDERAL POWER COMMISSION

[Docket No. CP73-98]

BOSTON GAS CO.

Notice of Application

October 16, 1972.

Take notice that on October 10, 1972, Boston Gas Co. (Applicant), 4900 Prudential Tower, Boston, Mass. 02199, filed in Docket No. CP73-98 an application pursuant to section 3 of the Natural Gas Act for authorization to import from Algeria into the United States, by ship, up to approximately 630,000 barrels of liquefied natural gas (LNG), with a heating value of approximately 2,380 billion B.t.u.'s, during the period October 15, 1972, through January 31, 1973, all as more fully set forth in the application which is on file with the Commission and open to public inspection.

Applicant seeks authorization to import LNG from production at Hassi R'Mel, Algeria, by Sonatrach, and purchased from British Methane Ltd., a Bahamian corporation. Applicant states that the price of the LNG to be imported will be approximately $1.10 per million B.t.u.'s after allowance for in-transit boiloff and ship cooldown, plus freight and related expenses estimated at 33 cents per million B.t.u.'s. Applicant proposes to transport the LNG from LNG processing plants in Arzew, Algeria, to Boston Harbor by an oceangoing tanker or tankers to be chartered by Applicant. Applicant indicates that the LNG will be transferred on arrival in Boston from the tanker to LNG tanks at Everett, Mass., owned by Distrigas Corp. of Massachusetts, a wholly owned subsidiary of Distrigas Corp., by direct lines from dockside. Applicant states that the proposed importation of LNG will assist Applicant in alleviating curtailments in supplies from its pipeline supplier, Algonquin Gas Transmission Co., and from

Distrigas Corp. and that Applicant expects to share approximately 50 percent of the LNG with other customers of Distrigas Corp.

Any person desiring to be heard or to make any protest with reference to said application should on or before November 2, 1972, file with the Federal Power Commission, Washington, D.C. 20426, a petition to intervene or a protest in accordance with the requirements of the Commission's rules of practice and procedure (18 CFR 1.8 or 1.10). All protests filed with the Commission will be considered by it in determining the appropriate action to be taken but will not serve to make the protestants parties to the proceeding. Any person wishing to become a party to a proceeding or to participate as a party in any hearing therein must file a petition to intervene in accordance with the Commission's rules.

KENNETH F. PLUMB,
Secretary.

[FR Doc.72-17848 Filed 10-17-72;8:50 am]

[Docket No. CP73-95]

COLUMBIA GAS TRANSMISSION CORP.

Notice of Application

OCTOBER 16, 1972.

Take notice that on October 6, 1972, Columbia Gas Transmission Corp. (Applicant), 20 Montchanin Road, Wilmington, DE 19807, filed in Docket No. CP73-95 an application pursuant to section 7(c) of the Natural Gas Act for a certificate of public convenience and necessity authorizing the construction and operation of certain natural gas storage facilities in Pennsylvania, all as more fully set forth in the application which is on file with the Commission and open to public inspection.

Applicant states that it commenced emergency injections of natural gas into its proposed Artemas-B Storage Field in Bedford County, Pa., on September 21, 1972, within contemplation of § 157.22 of the regulations under the Natural Gas Act (18 CFR 157.22) and proposes herein to activate and operate two wells and to drill a new well in this storage field, which is a depleted production field.

Applicant states that the proposed conversion of this depleted production field, which is adjacent to its existing Artemas-A Storage Field, is necessary to enable it to utilize its present gas supply and storage capacity available to it in order to assist in maintaining as reliable and adequate service as possible to its customers during 1972-73 winter period and thereafter.

Applicant proposes to construct in 1973, 2,700 feet of 6-inch line and related facilities to connect the two existing wells and a new well to be drilled to Applicant's existing Line No. 29500 in Bedford County. Applicant indicates that existing facilities are presently being utilized for injection and will be used for withdrawals during the 1972-73 winter season.

Applicant estimates that it will require a period of 2 years to develop completely the proposed storage field and that the storage field will have a gas inventory capacity of 1,700,000 Mcf. at an average static wellhead pressure of 1,900 p.s.i.g.

Applicant estimates the total cost of the proposed project at $521,000, which it plans to finance from internally generated funds.

It appears reasonable and consistent with the public interest in this case to prescribe a period shorter than 15 days for the filing of petitions to intervene and protests. Therefore, any person desiring to be heard or to make any protest with reference to said application should on or before October 27, 1972, file with the Federal Power Commission, Washington, D.C. 20426, a petition to intervene or a protest in accordance with the requirements of the Commission's rules of practice and procedure (18 CFR 1.8 or 1.10) and the regulations under the Natural Gas Act (18 CFR 157.10). All protests filed with the Commission will be considered by it in determining the appropriate action to be taken but will not serve to make the protestants parties to the proceeding. Any person wishing to become a party to a proceeding or to participate as a party in any hearing therein must file a petition to intervene in accordance with the Commission's rules.

Take further notice that, pursuant to the authority contained in and subject to the jurisdiction conferred upon the Federal Power Commission by sections 7 and 15 of the Natural Gas Act and the Commission's rules of practice and procedure, a hearing will be held without further notice before the Commission on this application if no petition to intervene is filed within the time required herein, if the Commission on its own review of the matter finds that a grant of the certificate is required by the public convenience and necessity. If a petition for leave to intervene is timely filed, or if the Commission on its own motion believes that a formal hearing is required, further notice of such hearing will be duly given.

Under the procedure herein provided for, unless otherwise advised, it will be unnecessary for Applicant to appear or be represented at the hearing.

KENNETH F. PLUMB,
Secretary.

[FR Doc.72-17849 Filed 10-17-72;8:50 am]

FEDERAL RESERVE SYSTEM

ELLIS BANKING CORP.

Acquisition of Bank

Ellis Banking Corporation, Bradenton, Fla., has applied for the Board's approval under section 3(a)(3) of the Bank Holding Company Act (12 U.S.C. 1842(a)(3)) to acquire 100 percent of the voting shares (less directors' qualifying shares) of First Security Bank, Bradenton, Fla., a proposed new bank. The factors that are considered in acting on the application are set forth in section 3(c) of the Act (12 U.S.C. 1842(c)).

The application may be inspected at the office of the Board of Governors or at the Federal Reserve Bank of Atlanta. Any person wishing to comment on the application should submit his views in writing to the Secretary, Board of Governors of the Federal Reserve System, Washington, D.C. 20551, to be received not later than November 8, 1972.

Board of Governors of the Federal Reserve System, October 11, 1972.

[SEAL] MICHAEL A. GREENSPAN,
Assistant Secretary of the Board.

[FR Doc.72-17698 Filed 10-17-72;8:45 am]

PACESETTER FINANCIAL CORP.

Formation of Bank Holding Company

Pacesetter Financial Corp., Grand Haven, Mich., has applied for the Board's approval under section 3(a)(1) of the Bank Holding Company Act (12 U.S.C. 1842(a)(1)) to become a bank holding company through acquisition of 100 percent of the voting shares of the successor by consolidation to Security First Bank & Trust Co., Grand Haven, Mich.; and the successor by consolidation to Traverse City State Bank, Traverse City, Mich. The factors that are considered in acting on the application are set forth in section 3(c) of the Act (12 U.S.C. 1842(c)).

The application may be inspected at the office of the Board of Governors or at the Federal Reserve Bank of Chicago. Any person wishing to comment on the application should submit his views in writing to the Secretary, Board of Governors of the Federal Reserve System, Washington, D.C. 20551, to be received not later than November 8, 1972.

Board of Governors of the Federal Reserve System, October 11, 1972.

[SEAL] MICHAEL A. GREENSPAN,
Assistant Secretary of the Board.

[FR Doc.72-17699 Filed 10-17-72;8:45 am]

BANK HOLDING COMPANIES

Grandfather Privileges

Correction

In F.R. Doc. 72-17239 appearing on page 21382 of the issue for Saturday, October 7, 1972, in the second paragraph of the "Bank Holding Companies", the third holding company should read "Hopeton Holding Corp., Wilmington, Del.", instead of "Chicago, Ill."

INSURED BANKS

Joint Call for Report of Condition

CROSS REFERENCE: For a document regarding joint call for condition of insured banks, see F.R. Doc. 72-17717, Federal Deposit Insurance Corporation, *supra.*

NATIONAL SCIENCE FOUNDATION

ADVISORY PANEL FOR OCEANOGRAPHY

Notice of Meeting

Notice is hereby given in accordance with Executive Order 11671, section 13.(a) (1) and (2), dated June 5, 1972, that a meeting of the Advisory Panel for Oceanography will be held at 9 a.m. on October 26 and 27, 1972, at 1800 G Street NW., Washington, DC 20550 (meeting room locations are indicated in the agenda, below). The purpose of this panel is to provide advice and recommendations (a) concerning support for research in Oceanography; and (b) as part of the review and evaluation process for specific proposals and projects.

The agenda for this meeting is as follows:

OCTOBER 26 SESSION

This session will be devoted to the review and evaluation of pending proposals—Rooms 642 and 321.

OCTOBER 27 SESSION

1. Review and evaluation of pending proposals—Rooms 642 and 321.
2. Remarks on Executive Order 11671 by the Deputy Assistant Director for Research—Room 642.
3. Discussion on Oceanography Section activities—Room 642.

The entire October 26 session as well as the period covered by agenda item 1 of the October 27 session will not be open to the public in accordance with the determination by the Director of the National Science Foundation dated August 23, 1972, pursuant to the provisions of Executive Order 11671, section 13.(d). The remaining portion of the meeting, covering agenda items 2 and 3 of the October 27 session, will be open to the public as observers only.

Summary minutes relative to this meeting may be obtained by contacting the Management Analysis Office, Room 245, 1800 G Street NW., Washington, DC 20550.

T. E. JENKINS,
Assistant Director
for Administration.

OCTOBER 12, 1972.

[FR Doc.72-17741 Filed 10-17-72;8:49 am]

ADVISORY PANEL FOR GENETIC BIOLOGY

Notice of Meeting

Pursuant to Executive Order 11671, notice is hereby given that a meeting of the Advisory Panel for Genetic Biology will be held at 9 a.m. on October 27 and 28, 1972, in Room 511, 1800 G Street NW., Washington, DC 20550. The purpose of this panel is to provide advice and recommendations as part of the review and evaluation process for specific proposals and projects.

The agenda will be devoted to the review and evaluation of research proposals or projects; therefore, the meeting will not be open to the public in accordance with the determination by the Director of the National Science Foundation dated August 23, 1972, pursuant to the provisions of Executive Order 11671, section 13(d).

For further information relative to this committee, contact Mrs. Mary Wolff, Associate Program Director, Genetic Biology Program, Division of Biological and Medical Sciences, Room 326, 1800 G Street NW., Washington, DC 20550.

T. E. JENKINS,
Assistant Director
for Administration.

OCTOBER 12, 1972.

[FR Doc.72-17742 Filed 10-17-72;8:49 am]

ADVISORY PANEL FOR PSYCHOBIOLOGY

Notice of Meeting

Pursuant to Executive Order 11671, notice is hereby given that a meeting of the Advisory Panel for Psychobiology will be held at 9 a.m. on October 31 and November 1, 1972, in Room 338, 1800 G Street NW., Washington, DC 20550. The purpose of this panel is to provide advice and recommendations as part of the review and evaluation process for specific proposals and projects.

The agenda will be devoted to the review of research proposals or projects which have been assigned to the Psychobiology Program to evaluate their scientific merit; therefore, the meeting will not be open to the public in accordance with the determination by the Director of the National Science Foundation dated August 23, 1972, pursuant to the provisions of Executive Order 11671, section 13(d).

For further information relative to this committee, contact Dr. Henry S. Odbert, Program Director, Psychobiology Program, Division of Biological and Medical Sciences, Room 333, 1800 G Street NW., Washington, DC 20550.

T. E. JENKINS,
Assistant Director
for Administration.

OCTOBER 12, 1972.

[FR Doc.72-17743 Filed 10-17-72;8:50 am]

SECURITIES AND EXCHANGE COMMISSION

[812-3018]

CONTINENTAL ASSURANCE CO. AND CONTINENTAL ASSURANCE CO. SEPARATE ACCOUNT (B)

Notice of Filing of Application for Exemption From Provisions

OCTOBER 11, 1972.

Notice is hereby given that Continental Assurance Company (Company), an Illinois life insurance company, and Continental Assurance Company Separate Account (B) (Account), 310 South Michigan Avenue, Chicago, IL 60604, an open-end diversified management company registered under the Investment Company Act of 1940 (Act) (hereinafter collectively called "Applicants"), have filed an application pursuant to section 6(c) of the Act for an order exempting the Applicants from the provisions of section 22(d) of the Act. All interested persons are referred to the application, as amended, on file with the Commission for a statement of the representations therein, which are summarized below.

Section 22(d) of the Act provides, in pertinent part, that no registered investment company or principal underwriter thereof shall sell any redeemable security issued by such company to any person except at a current public offering price described in the prospectus.

Applicants propose to establish a schedule of reduced sales charges and request an exemption to permit, in determining the points at which discounts will apply, consideration of the total of purchase payments made rather than the quantity of securities previously purchased or acquired and then held plus the securities being purchased. Applicants contend that it is administratively impractical to consider redemptions or fluctuations in the value of the Account. In addition, they assert that redemptions by participants having an interest in the Account are an infrequent occurrence.

Section 6(c) of the Act provides that the Commission, by order upon application, may conditionally or unconditionally exempt any person, security, or transaction from any provision or provisions of the Act, if and to the extent that such exemption is necessary or appropriate in the public interest and consistent with the protection of investors and the purposes fairly intended by the policies and provisions of the Act.

Notice is further given that any interested person may, not later than November 8, 1972, at 5:30 p.m., submit to the Commission in writing a request for a hearing on the matter accompanied by a statement as to the issue, if any, of fact or law proposed to be controverted, or he may request that he be notified if the Commission should order a hearing thereon. Any such communication should be addressed: Secretary, Securities and Exchange Commission, Washington, D.C. 20549. A copy of such request shall be served personally or by mail (airmail if the person being served is located more than 500 miles from the point of mailing) upon the Applicants at the address stated above. Proof of such service (by affidavit or in case of an attorney at law by certificate) shall be filed contemporaneously with the request. At any time after said date, as provided by Rule 0-5 of the rules and regulations promulgated under the Act, an order disposing of the application herein may be issued by the Commission upon the basis of the information stated in said application, unless an order for hearing upon said application shall be issued upon request or upon the Commission's own motion. Persons who request a hearing or advice as to whether a hearing is ordered will receive notice of further developments in this matter, including the date of the hearing (if ordered) and any postponements thereof.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17744 Filed 10-17-72;8:49 am]

[File No. 500-1]

CONTINENTAL VENDING MACHINE CORP.

Order Suspending Trading

OCTOBER 11, 1972.

It appearing to the Securities and Exchange Commission that the summary suspension of trading in the common stock, $0.10 par value, of Continental Vending Machine Corp., and the 6 percent convertible subordinated debentures due September 1, 1976, being traded otherwise than on a national securities exchange is required in the public interest and for the protection of investors:

It is ordered, Pursuant to section 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities otherwise than on a national securities exchange be summarily suspended, this order to be effective for the period from October 12, 1972, through October 21, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17747 Filed 10-17-72;8:49 am]

[File No. 500-1]

CRYSTALOGRAPHY CORP.

Order Suspending Trading

OCTOBER 11, 1972.

It appearing to the Securities and Exchange Commission that the summary suspension of trading in the common stock, $0.01 par value, and all other securities of Crystalography Corp. being traded otherwise than on a national securities exchange is required in the public interest and for the protection of investors:

It is ordered, Pursuant to section 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities otherwise than on a national securities exchange be summarily suspended, this order to be effective for the period from 1:50 p.m., e.d.t., on October 11, 1972, through October 20, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc. 72-17748 Filed 10-17-72;8:49 am]

[812-3250]

EATON & HOWARD BALANCED FUND

Notice of Filing of Application for An Order Exempting Sale By Open-End Company of Its Shares at Other Than Public Offering Price

OCTOBER 11, 1972.

Notice is hereby given that Eaton & Howard Balanced Fund (Applicant), 24 Federal Street, Boston Massachusetts 02110, a common law trust existing under the laws of Massachusetts registered under the Investment Company Act of 1940 (Act) as an open-end diversified management investment company, has filed an application pursuant to section 6(c) of the Act requesting an order of the Commission exempting from the provisions of section 22(d) of the Act a transaction in which Applicant's redeemable securities will be issued at a price other than the current public offering price described in the prospectus, in exchange for substantially all of the assets of George A. Meyer Finance Co. (Meyer). All interested persons are referred to the application on file with the Commission for a statement of Applicant's representations which are summarized below.

Meyer, a corporation existing under the laws of Delaware, is a private investment company. All of the outstanding preferred stock of Meyer is held in 15 shareholder accounts and all of its outstanding common stock is held by seven shareholders. Meyer is exempt from registration under the Act by reason of the provisions of section (3)(c)(1) thereof. Pursuant to an agreement between Applicant and Meyer substantially all of the cash and securities owned by Meyer with a value of approximately $3,748,000 as of June 30, 1972, will be transferred to Applicant in exchange for shares of its capital stock. The number of shares of Applicant to be issued is to be determined by dividing the aggregate market value (with certain adjustments as set forth in detail in the application) of the assets of Meyer to be transferred to Applicant by the net asset value per share of Applicant both to be determined as of a valuation time, as defined in the agreement. If the valuation under the agreement had taken place on June 30, 1972, Meyer would have received 341,975 shares of Applicant's stock. The exchange contemplated by the agreement would be prohibited by section 22(d) as being a sale of a redeemable security by a registered investment company at a price other than a current offering price described in the prospectus, unless exempted by an order under section 6(c) of the Act.

When received by Meyer, the shares of Applicant, which are registered under the Securities Act of 1933, are to be distributed to the shareholders of Meyer as a distribution in complete liquidation and Meyer will be dissolved. Applicant has been advised by the management of Meyer that the shareholders of Meyer have no present intention of redeeming any of Applicant's shares following the proposed transaction.

There is no affiliation between Applicant and Meyer. Meyer is not an affiliated person of any affiliated person of Applicant, and the agreement was negotiated at arm's length by the two companies. Applicant states that the Board of Trustees approved the agreement as being beneficial to its shareholders, because among other things, Applicant will be able to acquire at one time substantial additions to its portfolio securities without affecting the market in those securities and without incurring brokerage commissions.

Section 22(d) of the Act provides that registered investment companies issuing redeemable securities may sell their shares only at the current public offering price as described in the prospectus. Section 6(c) permits the Commission, upon application, to exempt such a transaction if it finds that such an exemption is necessary or appropriate in the public interest and consistent with the protection of investors and purposes fairly intended by the policy and provisions of the Act.

Applicant contends that the proposed offering of its stock will comply with the provisions of the Act, other than section 22(d) and submits that the granting of the application is necessary and appropriate in the public interest and consistent with the protection of investors and the purposes fairly intended by the policy and provisions of the Act.

Notice is further given that any interested person may, not later than November 3, 1972, at 5:30 p.m., submit to the Commission in writing a request for a hearing on the matter accompanied by a statement as to the nature of his interest, the reason for such request and the issues of fact or law proposed to be controverted, or he may request that he be notified if the Commission should order a hearing thereon. Any such communication should be addressed: Secretary, Securities and Exchange Commission, Washington, D.C. 20549. A copy of such request shall be served personally or by mail (airmail if the person being served is located more than 500 miles from the point of mailing) upon Applicant at the address stated above. Proof of such service (by affidavit or in case of an attorney at law by certificate) shall be filed contemporaneously with the request. At any time after said date, as provided by Rule 0-5 of the rules and regulations promulgated under the Act, an order disposing of the application herein may be issued by the Commission upon the basis of the information stated in said application, unless an order for hearing upon said application shall be issued upon request or upon the Commission's own motion. Persons who request a hearing or advice as to whether a hearing is ordered, will receive notice of further developments in this matter, including the date of the hearing (if ordered) and any postponements thereof.

For the Commission, by the Division of Investment Company Regulation, pursuant to delegated authority.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17745 Filed 10-17-72;8:49 am]

[File No. 500-1]

GOODWAY INC.

Order Suspending Trading

OCTOBER 10, 1972.

The common stock, $0.10 par value of Goodway Inc. being traded on the American Stock Exchange, pursuant to provisions of the Securities Exchange Act of 1934 and all other securities of Goodway Inc. being traded otherwise than on a national securities exchange; and

It appearing to the Securities and Exchange Commission that the summary suspension of trading in such securities on such exchanges and otherwise than on a national securities exchange is required in the public interest and for the protection of investors:

It is ordered, Pursuant to sections 19(a)(4) and 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities on the above mentioned exchange and otherwise than on a national securities exchange be summarily suspended, this order to be effective for the period from 12 p.m. on October 10, 1972, through October 19, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17749 Filed 10-17-72;8:49 am]

[File No. 500-1]

MINUTE APPROVED CREDIT PLAN, INC.

Order Suspending Trading

OCTOBER 10, 1972.

It appearing to the Securities and Exchange Commission that the summary suspension of trading in the common stock, $0.05 par value, and all other securities of Minute Approved Credit Plan, Inc., being traded otherwise than on a national securities exchange is required in the public interest and for the protection of investors;

It is ordered, Pursuant to section 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities otherwise than on a national securities exchange, be summarily suspended, this order to be effective for the period from October 11, 1972, through October 20, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17750 Filed 10-17-72;8:49 am]

[File No. 500-1]

NORTH AMERICAN PLANNING CORP.

Order Suspending Trading

OCTOBER 11, 1972.

It appearing to the Securities and Exchange Commission that the summary suspension of trading in the Class B nonvoting common stock, $0.01 par value and all other securities of North American Planning Corp., being traded otherwise than on a national securities exchange is required in the public interest and for the protection of investors:

It is ordered, Pursuant to section 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities otherwise than on a national securities exchange be summarily suspended, this order to be effective for the period from October 12, 1972, through October 21, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17751 Filed 10-17-72;8:49 am]

[File No. 500-1]

POWER CONVERSION, INC.

Order Suspending Trading

OCTOBER 6, 1972.

It appearing to the Securities and Exchange Commission that the summary suspension of trading in the common stock, $0.01 par value, and all other securities of Power Conversion, Inc., being traded otherwise than on a national securities exchange is required in the public interest and for the protection of investors:

It is ordered, pursuant to section 15(c)(5) of the Securities Exchange Act of 1934, that trading in such securities otherwise than on a national securities exchange be summarily suspended, this order to be effective for the period from 6 p.m., E.D.T., on October 6, 1972, through October 15, 1972.

By the Commission.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17752 Filed 10-17-72;8:49 am]

[70-5241]

SOUTHERN CO. ET AL.

Notice of Proposed Change of Corporate Domicile

OCTOBER 11, 1972.

In the matter of The Southern Co., Atlanta, Ga. 30346; Mississippi Power Co. (a Maine Corporation); Mississippi Power Co. (a Mississippi Corporation), 2992 West Beach, Gulfport, MS 39501 (70-5241).

Notice is hereby given that The Southern Co. (Southern), a registered holding company, Mississippi Power Co. (Maine Company), a public-utility subsidiary of Southern, and Mississippi Power Co. (Mississippi Company), a proposed subsidiary of Southern, have filed an application-declaration, pursuant to the Public Utility Holding Company Act of 1935 (Act), designating sections 6(a), 7, 9(a), 9(b), 10, 12(c), 12(e), and 12(f) of the Act and Rules 42, 43, and 62 promulgated thereunder as applicable to the proposed transaction. All interested persons are referred to the application-declaration, which is summarized below, for a complete statement of the proposed transaction.

In order to change its corporate domicile from the State of Maine to the State of Mississippi, Maine Company proposes to merge with the Mississippi Company which was incorporated for such purpose. This merger will be presented to the stockholders at a Special Meeting to be held on December 18, 1972, for their approval. Maine Company intends to solicit proxies from the holders of its preferred stock through the use of solicitation material. It is stated that an affirmative vote of the holders of a majority of the total number of outstanding shares of Maine Company stock and of the total number of outstanding shares of Maine Company preferred stock are required for approval of the merger. It is further stated that a favorable vote of the holders of two-thirds of the outstanding shares of Mississippi Company common stock are required for approval of the merger. It is the present intention of Southern, as holder of all outstanding shares of Maine Company common stock, and of the holders of all outstanding shares of Mississippi Company common stock to vote in favor of the merger.

The application-declaration states that although the Maine Company has been incorporated in the State of Maine for many years, substantially all of the Maine Company's utility properties, operations and all other business offices are located in the State of Mississippi, and the Maine Company's business is carried on subject to and in accordance with the laws of the State of Mississippi thereby making the State of Mississippi the most appropriate place to incorporate. It is further stated that incorporation in Mississippi is beneficial in that it: (1) Promotes better understanding of the company by State and local governmental authorities, (2) relieves the company of annual taxes now payable to the State of Maine, amounting currently to $7,000, and of the miscellaneous other expenses incident to the maintenance of a statutory office in the State of Maine, and (3) can be effectuated without any alteration in the rights of stockholders or the indenture rights of the holders of outstanding debt.

It is stated that following the merger, Mississippi Company will own and operate the electric utility properties formerly owned and operated by Maine Company, and will also have a capital structure identical with the present capital structure of Maine Company so that the accounts of Mississippi will be identical in all material respects with the accounts of Maine Company; furthermore no changes in accounting principles or practices are contemplated. There are no variations of substance between the Articles of Incorporation or the bylaws of the two companies, except that (1) in accordance with the requirement of the Mississippi Business Corporation Act, (a) the Articles of Incorporation of Mississippi Company provides that its corporate existence shall be limited to 99 years whereas the Maine Company's provides perpetual existence and (b) the rights and preferences of the various series of preferred stock are set forth in the Mississippi Company's Articles of Incorporation whereas they were included in Maine Company's bylaws, and; (2) absent an amendment of its Articles, Mississippi Company will not be authorized, as is Maine Company, to engage in the street railway, telegraph, or telephone business. The present directors will continue as directors of Mississippi, and the present officers of Maine Company will hold corresponding officers in Mississippi Company.

It is stated that the fees and expenses incurred in connection with the proposed transaction total $57,500 including fees for counsel of $37,500. It is further stated that the proposed transaction is subject to the jurisdiction of the Mississippi Public Service Commission and that the requisite order of that Commission will be filed herein by amendment.

Notice is further given that any interested person may, not later than October 30, 1972, request in writing that a hearing be held on such matters, stating the nature of his interest, the reasons for such request, and the issues of fact or law raised by said application-declaration which he desires to controvert; or he may request that he be notified if the Commission should order a hearing thereon. Any such request should be addressed: Secretary, Securities and Exchange Commission, Washington, D.C. 20549. A copy of such request should be served personally or by mail (airmail if the person being served is located more than 500 miles from the point of mailing) upon the application-declaration at the above-stated address, and proof of service (by affidavit or, in case of an attorney at law, by certificate) should be filed with the request. At any time after said date, the application-declaration as filed or as amended, may be granted and permitted to become effective as provided in Rule 23 of the general rules and regulations promulgated under the Act, or the Commission may grant exemption from its rules as provided in Rules 20(a) and 100 thereof or take such other action as it may deem appropriate. Persons who request a hearing or advice as to whether a hearing is ordered will receive notice of further developments in this matter, including the date of the hearing (if ordered) and any postponements thereof.

For the Commission, by the Division of Corporate Regulation, pursuant to delegated authority.

[SEAL] RONALD F. HUNT,
Secretary.

[FR Doc.72-17746 Filed 10-17-72;8:49 am]

INTERSTATE COMMERCE COMMISSION

[Notice 98]

ASSIGNMENT OF HEARINGS

OCTOBER 13, 1972.

Cases assigned for hearing, postponement, cancellation, or oral argument appear below and will be published only once. This list contains prospective assignments only and does not include cases previously assigned hearing dates. The hearings will be on the issues as presently reflected in the Official Docket of the Commission. An attempt will be made to publish notices of cancellation of hearings as promptly as possible, but interested parties should take appropriate steps to insure that they are notified of cancellation or postponements of hearings in which they are interested. No amendments will be entertained after the date of this publication.

MC 41432 Sub 126, East Texas Motor Freight Lines, Inc., MC 83539 Sub 345, C & H Transportation Co., Inc., now being assigned December 4, 1972 (1 day), at Dallas, Tex., in a hearing room to be later designated.

MC-F-11539, Commercial Carriers, Inc.—control and merger—B & H Truckaway Co., MC 43038 Sub 451, Commercial Carriers, Inc., now assigned November 13, 1972, at San Francisco, Calif., is postponed indefinitely.

MC-C-7850, American Movers & Storage, C & M Moving & Storage, American Red Ball Transit Co., Inc., Bekins Van Lines Co., and Towne Services Household Goods Transportation Co., Inc.—investigation of operations—now assigned December 4, 1972, at Dallas, Tex., hearing is postponed indefinitely.

MC 117465 Sub 18, Beaver Express Service, Inc., now assigned November 27, 1972, at Amarillo, Tex., is postponed indefinitely.

MC-F-11372, Roadway Express, Inc.—control and merger—Poole Transfer, now assigned October 30, 1972, at Chicago, Ill., will be held at La Salle Hotel, 10 North La Salle Street, Chicago, IL.

MC-112989 Sub 23, West Coast Truck Lines, Inc., now assigned November 6, 1972, at Portland, Oreg., will be held in Room 401, Multnomah Building, 319 South West Pine Street, Portland, OR.

MCC-7796, C. A. White Trucking Co. and McAlister Trucking Co.—investigation and revocation of certificates, MC 23618 Sub 18, McAlister Trucking Co., MC 60157 Sub 18, C. A. White Trucking Co., now assigned November 27, 1972, at Denver, Colo., hearing will be held in Room 595, U.S. Courthouse, 1929 Stout Street.

MCC-7796, C. A. White Trucking Co. and McAlister Trucking Co.—investigation and revocation of certificates, MC 23618 Sub 18, McAlister Trucking Co., MC 60157 Sub 18, C. A. White Trucking Co., now assigned November 30, 1972, at Tucson, Ariz., hearing will be held in Room 200, New State Office Building, 415 West Congress Street.

MC 61592 Sub 269, Jenkins Truck Line, Inc., now assigned November 6, 1972, at Atlanta, Ga., will be held in Room 305, 1252 West Peachtree Street NW.

MC 121060 Sub 17, Arrow Truck Lines, Inc., now assigned November 7, 1972, at Atlanta, Ga., will be held in Room 305, 1252 West Peachtree Street, NW.

MC 115841 Sub 407, Colonial Refrigerated Transportation, Inc., now assigned November 8, 1972, at Atlanta, Ga., will be held in Room 305, 1252 West Peachtree Street NW.

MC-115826 Sub 220, W. J. Digby, Inc., now being assigned continued hearing November 13, 1972, at Denver, Colo., will be held in Courtroom, Fifth Floor Federal Building, 19th and Stout Streets, Denver, Colo.

MC 115840 Sub 75, Colonial Fast Freight Lines, Inc., now assigned October 30, 1972, MC-C-7346, Gulf Transport Co.—investigation of practices, now assigned November 1, 1972, MC 73165 Sub 304, Eagle Motor Lines, Inc., now assigned November 2, 1972, MC 135274, Britton & Southern, Inc., now assigned November 3, 1972, MC 73688 Sub 50, Southern Trucking Corp., now assigned November 6, 1972, MC 107295 Sub 521, Pre-Fab Transit Co., now assigned November 7, 1972, MC 115162 Sub 224, Poole Truck Line, Inc., now assigned November 8, 1972, MC-C-7668, Georgia - Florida - Alabama Transp. Co. and Bay Transp., Inc.—investigation and revocation of certificates, now assigned November 9, 1972, will be held in the Department of Labor, Conference Room, 1931 Ninth Avenue South, Birmingham, Ala.

MC 116544 Sub 129, Wilson Brothers Truck Line, Inc., now assigned November 6, 1972, at New Orleans, La., is postponed indefinitely.

MC 4405 Sub 494, Dealers Transit, Inc., now assigned October 24, 1972, at Washington, D.C., is postponed indefinitely.

MC 109462 Sub 18, Lumber Transport, Inc., now assigned December 4, 1972, MC 133093 Sub 4, Clifford Jones, doing business as Jones Truck Line, now assigned December 11, 1972, at Albuquerque, N. Mex., hearings will be held in Room 1410, Federal Office Building, 517 Gold SW.

MC 115841 Sub 421, Colonial Refrigerated Transportation, Inc., now assigned December 13, 1972, MC 133796 Sub 7, George Appel, now assigned December 14, 1972, at Los Angeles, Calif., will be held in Room 7210, Federal Building, 300 North Los Angeles Street.

NO. 35632, Nebraska Intrastate Freight Rates and Charges—1972, now being assigned hearing January 29, 1973 (1 week), at Lincoln, Nebr., in a hearing room to be later designated.

NO. 35598, North Carolina Intrastate Freight Rates and Charges—1972, now being assigned hearing January 29, 1973 (1 week), at Raleigh, N.C., in a hearing room to be later designated.

MC-C-7838, Moore Van & Storage, Inc., James W. Moore, doing business as Fort Worth Transfer Co. & Fort Worth Storage & Transfer Co., O. K. Transfer & Storage Co., Cartwright Van Lines, Inc., and American Red Ball Transit Co. Inc.—investigation of operations, now assigned October 31, 1972, at Dallas, Tex., is postponed indefinitely.

MC 124606 Sub 3, Ford Truck Line, Inc., now being assigned December 11, 1972 (1 week), at Memphis, Tenn., in a hearing room to be later designated.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17766 Filed 10-17-72;8:50 am]

[Notice 28]

MOTOR CARRIER ALTERNATE ROUTE DEVIATION NOTICES

OCTOBER 13, 1972.

The following letter-notices of proposals (except as otherwise specifically noted, each applicant states that there will be no significant effect on the quality of the human environment resulting from approval of its application), to operate over deviation routes for operating convenience only have been filed with the Interstate Commerce Commission under the Commission's Revised Deviation Rules—Motor Carriers of Passengers, 1969 (59 CFR 1042.2(c)(9)) and notice thereof to all interested persons is hereby given as provided in such rules (49 CFR 1042.2(c)(9)).

Protests against the use of any proposed deviation route herein described may be filed with the Interstate Commerce Commission in the manner and form provided in such rules (49 CFR 1042.2(c)(9)) at any time, but will not operate to stay commencement of the proposed operations unless filed within 30 days from the date of publication.

Successively filed letter-notices of the same carrier under the Commission's Revised Deviation Rules—Motor Carriers of Property, 1969, will be numbered consecutively for convenience in identification and protests, if any, should refer to such letter-notices by number.

MOTOR CARRIERS OF PASSENGERS

No. MC-1515 (Deviation No. 629) (Cancels Deviation No. 490), GREYHOUND LINES, INC. (Eastern Division), 1400 West Third Street, Cleveland, OH 44113, filed September 28, 1972. Carrier proposes to operate as a *common carrier*, by motor vehicle, of *passengers and their baggage, and express and newspapers* in the same vehicle with passengers, over a deviation route as follows: From Jacksonville, Fla., over Interstate Highway 95 to junction Georgia Highway 40, thence over Georgia Highway 40 to junction U.S. Highway 17 at Kingsland, Ga., and return over the same route, for operating convenience only. The notice indicates that the carrier is presently authorized to transport passengers and the same property, over a pertinent service route as follows: from Pocatalico, S.C., over U.S. Highway 17 to Brunswick, Ga., thence over unnumbered highway to Sea Island, Ga., thence return over unnumbered highway to Brunswick, Ga., thence over U.S. Highway 17 to Jacksonville, Fla., and return over the same route.

No. MC-1515 (Deviation No. 630) (Cancels Deviation No. 588), GREYHOUND LINES, INC. (Eastern Division), 1400 West Third Street, Cleveland, OH 44113, filed September 28, 1972. Carrier proposes to operate as a *common carrier*, by motor vehicle, of *passengers and their baggage, and express and newspapers* in the same vehicle with passengers, over a deviation route as follows: From Memphis, Tenn., over Interstate Highway 55 to junction U.S. Highway 51 just south of Ponchatoula, La., with the following access routes: (1) From Crystal Springs, Miss., over Mississippi Highway 27 to junction Interstate Highway 55, (2) from McComb, Miss., over U.S. Highway 98 to junction Interstate Highway 55, and (3) from McComb, Miss., over Mississippi Highway 24 to junction Interstate Highway 55, and return over the same route, for operating convenience only. The notice indicates that the carrier is presently authorized to transport passengers and the same property, over pertinent service routes as follows: (1) From Turrell, Ark., over U.S. Highway 61 to Clarksdale, Miss., (2) from Clarksdale, Miss., over U.S. Highway 49 to Tutwiler, Miss., thence over U.S. Highway 49-E to junction old U.S. Highway 49-E at a point approximately 1.3 miles north of Yazoo City, Miss., thence over U.S. Highway 49-E to Yazoo City, Miss., thence over U.S. Highway 49 to Jackson, Miss., (3) from Jackson, Miss., over U.S. Highway 51 to LaPlace, La., and (4) from Fulton, Ky., over U.S. Highway 51 via Union City, Dyersburg, and Memphis, Tenn., to Jackson, Miss., and return over the same routes.

No. MC-1515 (Deviation No. 631) GREYHOUND LINES, INC. (Eastern Division), 1400 West Third Street, Cleveland, OH 44113, filed September 28, 1972. Carrier proposes to operate as a *common carrier*, by motor vehicle, of *passengers and their baggage, and express and newspapers* in the same vehicle with passengers, over a deviation route as follows: From Baton Rouge, La., over Interstate Highway 12 to junction U.S. Highway 51, thence over U.S. Highway 51 to Hammond, La., and return over the same route, for operating convenience only. The notice indicates that the carrier is presently authorized to transport passengers and the same property, over a pertinent service route as follows: From Baton Rouge, La., over U.S. Highway 190 to Hammond, La., and return over the same route.

No. MC-1515 (Deviation No. 632), GREYHOUND LINES, INC. (Eastern Division), 1400 West Third Street, Cleveland, OH 44113, filed October 2, 1972. Carrier proposes to operate as a *common carrier* by motor vehicle, of *passengers and their baggage, and express and newspapers* in the same vehicle with passengers, over a deviation route as follows: From Macon, Ga., over Interstate Highway 16 to junction Georgia Highway 257, thence over Georgia Highway 257 to junction U.S. Highway 80, near Dublin, Ga., and return over the same route, for operating convenience only. The notice indicates that the carrier is presently authorized to transport passengers and the same property, over a pertinent service route as follows: Between Macon, Ga., and Savannah, Ga., over U.S. Highway 80.

No. MC-1515 (Deviation No. 633) (Cancels Deviation No. 508), GREYHOUND LINES, INC. (Eastern Division), 1400 West Third Street, Cleveland, OH 44113, filed October 2, 1972. Carrier proposes to operate as a *common carrier*, by motor vehicle, of *passengers and their baggage, and express and newspapers* in the same vehicle with passengers, over deviation routes, as follows: (1) From junction U.S. Highway 31 and Interstate Highway 10 at Spanish Fort, Ala., over Interstate Highway 10 to junction U.S. Highway 331, thence over U.S. Highway 331 to junction U.S. Highway 90 at Defuniak Springs, Fla., with the following excess routes: (a) From Pensacola, Fla., over U.S. Highway 29 to junction Interstate Highway 10, (b) from Milton, Fla., over Florida Highway 191 to junction Interstate Highway 10, and (c) from Crestview, Fla., over Florida Highway 85 to junction Interstate Highway 10, and (2) from Jacksonville, Fla., over Interstate Highway 10 to junction Florida Highway 53, thence over Florida Highway 53 to junction U.S. Highway 90 at Madison, Fla., with the following access routes (a) from Lake City, Fla., over U.S. Highway 441 to junction Interstate Highway 10, and (b) from Live Oak, Fla., over U.S. Highway 129 to junction Interstate Highway 10, and return over the same routes, for operating covenience only. The notice indicates that the carrier is presently authorized to transport passengers and the same property, over pertinent service routes as follows: (1) From Montgomery, Ala., over U.S. Highway 31 via Flomation, Ala., to Mobile, Ala., (2) from Marianna, Fla., over U.S. Highway 90 via Pensacola, Fla., to Bridgehead, Ala., thence over U.S. Highway 98 via Fairhope, Fla., to Point Clear, Ala., (3) from Dothan, Ala., over U.S. Highway 231 to junction Florida Highway 73, thence over Florida Highway 73 to Marianna, Fla., thence over U.S. Highway 90 to Lake City, Fla., (4) from Chattanooga, Tenn., over U.S. Highway 41 via Macon, Ga., to Lake City, Fla., thence over U.S. Highway 90 to Jacksonville, Fla., and (5) from junction Alabama Highway 104 and U.S. Highway 98 (about 2 miles north of Fairhope, Ala.), over Alabama Highway 104 to junction Alabama Highway 59 (about one-half mile south of Robertsdale, Ala.), and return over the same routes.

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17763 Filed 10-17-72;8:50 am]

[Notice 31]

MOTOR CARRIER ALTERNATE ROUTE DEVIATION NOTICES

OCTOBER 13, 1972.

The following letter-notices of proposals (except as otherwise specifically noted, each applicant states that there will be no significant effect on the quality of the human environment resulting from approval of its application), to operate over deviation routes for operating convenience only have been filed with the Interstate Commerce Commission under the Commission's Revised Deviation Rules-Motor Carriers of Property, 1969 (49 CFR 1042.4(d)(11) and notice thereof to all interested persons is hereby given as provided in such rules (40 CFR 1042.4(d)(11)).

Protests against the use of any proposed deviation route herein described may be filed with the Interstate Commerce Commission in the manner and form provided in such rules (49 CFR 1042.4(d)(12) at any time, but will **not** operate to stay commencement of the proposed operations unless filed within 30 days from the date of publication.

Successively filed letter-notices of the same carrier under the Commission's Revised Deviation Rules-Motor Carriers of Property, 1969, will be numbered consecutively for convenience in identification and protests, if any, should refer to such letter-notices by number.

MOTOR CARRIERS OF PROPERTY

No. MC-61788 (Deviation No. 1), GEORGIA FLORIDA ALABAMA TRANSPORTATION COMPANY, 1541 Reeves Street, Dotham, AL 36301, filed September 28, 1972. Carrier proposes to operate as a *common carrier*, by motor vehicle, of *general commodities*, with certain exceptions, over a deviation route as follows: From Atlanta, Ga., over Interstate Highway 85 (using U.S. Highway 29 pending completion of any unfinished portions) to Montgomery, Ala., thence over Interstate Highway 65 to junction Alabama Highway 21, thence over Alabama Highway 21 to the Alabama-Florida State line, thence over Florida Highway 97 to junction U.S. Highway 29, thence over U.S. Highway 29 to Pensacola, Fla., and return over the same route, for operating convenience only. The notice indicates that the carrier is presently authorized to transport the same commodities, over pertinent service routes as follows: (1) From Atlanta, Ga., over U.S. Highway 29 to La Grange, Ga., thence over U.S. Highway 27 to Columbus, Ga., thence over U.S. Highway 431 to Dothan, Ala., thence over Alabama Highway 53 to the Alabama-Florida State line, thence over Florida Highway 141 to Malone, Fla., (2) from Dothan, Ala., over Alabama Highway 52 to Opp, Ala., thence over U.S. Highway 331 to the Alabama-Florida State line, thence over Florida Highway 85 to Crestview, Fla., thence over U.S. Highway 90 to Pensacola, Fla., and (3) from Florala, Ala., over Alabama Highway 54 to junction Alabama Highway 52, thence over Alabama Highway 52 to Samson, Ala., and return over the same routes.

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17764 Filed 10-17-72;8:50 am]

[Notice 85]

MOTOR CARRIER APPLICATIONS AND CERTAIN OTHER PROCEEDINGS

OCTOBER 13, 1972.

The following publications[1] are governed by the new special rule 1100.247 of the Commission's rules of practice, published in the FEDERAL REGISTER, issue of December 3, 1963, which became effective January 1, 1964.

The publications hereinafter set forth reflect the scope of the applications as filed by applicant, and may include descriptions, restrictions, or limitations which are not in a form acceptable to the Commission. Authority which ultimately may be granted as a result of the applications here noticed will not necessarily reflect the phraseology set forth in the application as filed, but also will eliminate any restrictions which are not acceptable to the Commission.

APPLICATIONS ASSIGNED FOR ORAL HEARING

MOTOR CARRIERS OF PROPERTY

No. MC 116710 (Sub-No. 17), filed September 28, 1972. Applicant: MISSISSIPPI CHEMICAL EXPRESS, INC., Post Office Box 1634, Hattiesburg, MS 39401. Applicant's representative: Leland D. Smith, Navasota, Tex. 77868. Authority sought to operate as a *contract carrier*, by motor vehicle, over irregular routes, transporting: (1) *Liquid sulphur dioxide*, in bulk, in tank vehicles, and in shipper-owned demountable cylinders, from Baton Rouge, La., to points in Alabama, Arkansas, Florida, Georgia, Illinois, Louisiana, Mississippi, New Mexico, Oklahoma, Tennessee, Texas, and Canton, N.C.; and (2) *Anhydrous aluminum chloride*, dry, in bulk, in tank vehicles, and in shipper-owned demountable containers, from Baton Rouge, La., to points in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Louisiana, Maryland, Mississippi, New Jersey, New Mexico, New York, Oklahoma, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, and West Virginia.

HEARING: November 7, 1972 (2 days), at 9:30 a.m. U.S. standard time, at New Orleans, La., at a hearing room to be later designated.

No. MC 84933 (Sub-No. 3) (Republication) filed December 7, 1971, published in the FEDERAL REGISTER issue of February 10, 1972, and republished this issue. Applicant: ELMIRA WATKINS GLEN TRANSIT CORPORATION, 220 Owego Street, Montour Falls, NY 14065. Applicant's representative: S. Harrison Kahn, Suite 733, Investment Building, Washington, D.C. 20005. An order of the Commission, operating rights board, dated September 18, 1972, and served October 4, 1972, finds that the present and future public convenience and necessity require operation by applicant, in interstate or foreign commerce, as a common carrier by motor vehicle, over irregular routes, of passengers and their baggage, in the same vehicle with passengers in special operations, in round trip, sightseeing, and pleasure tours, beginning and ending at points in Chemung, Yates, Schuyler, and Ontario Counties, N.Y., and Bradford County, Pa., and extending to points in the United States (except Alaska and Hawaii); that applicant is fit, willing, and able properly to perform such service and to conform to the requirements of the Interstate Commerce Act and the Commission's rules and regulations thereunder. Because it is possible that other parties, who have relied upon the notice of the application as published, may have an interest in and would be prejudiced by lack of proper notice of the authority described below, a notice of the authority actually granted will be published in the FEDERAL REGISTER and the issuance of a certificate in this proceeding will be withheld for a period of 30 days from the date of such publication, during which period any proper party in interest may file an appropriate petition for intervention or other relief in this proceeding setting forth in detail the precise manner in which it has been so prejudiced.

NOTICE FOR FILING OF PETITION

No. MC-69365 (Notice of Filing of Petition), filed June 12, 1972. Petitioner: CONTRACT CARRIER SERVICE, INC., doing business as ALPINE EXPRESS, INC., Post Office Box 2426, Eugene, OR 97402. Petitioner's representative: Tommie J. Yates (same address as petitioner). Petitioner presently holds permits in No. MC-69365 (Sub-No. 4), No. MC-69365 (Sub-No. 11), No. MC-69365 (Sub-No. 12), and No. MC 69365 (Sub-No. 13), issued February 24, 1959; October 6, 1960; December 8, 1960, and September 27, 1965, respectively, authorizing operations as a contract carrier by motor vehicle, over irregular routes, of: (1) Laminated wood products and prefabricated wooden timbers and trusses, from Longview, Wash., and Springfield, Oreg., to points in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Washington, under a continuing contract, or contracts, with Rosboro Lumber Co., of Springfield, Oreg., and Rilco Laminated Products, Inc., of Longview, Wash.; (2) laminated wooden beams, timbers, and arches, from the plantsite of the Rilco Laminated Products Division of the Weyerhaeuser Co., at or near Cottage Grove, Oreg., to points in Arizona, California, Colorado, Montana, Nevada, New Mexico, Utah, Wyoming, and points in that part of Nebraska in and west of Sheridan, Garden, and Deuel Counties, under a continuing contract, or contracts, with Rilco Laminated Products Division of Weyerhaeuser Co., of Cottage Grove, Oreg., and Associated Glu-Lam Products, Inc., of Berkeley, Calif.; (3) laminated wooden beams, timbers, and arches, from the site of the plant of Rilco Laminated Products Division of the Weyerhaeuser Co. at or near Cottage Grove, Oreg., to points in Washington, under a continuing contract, or contracts, with Rilco Laminated Products Division of the Weyerhaeuser Co.; and (4) (a) laminated wooden decking, from the plantsite of Weyerhaeuser Co. at Cottage Grove, Oreg., to points in California, Idaho, Montana, Nevada,

---

[1] Except as otherwise specifically noted, each applicant (on applications filed after Mar. 27, 1972) states that there will be no significant effect on the quality of the human environment resulting from approval of its application.

Utah, and Washington, and (b) lumber, timbers, millwork, panels, boards, and sheets, and hardware and accessories used in the installation of timbers and laminated wooden decking, beams, and arches, when moving with laminated wooden decking, beams, and arches, from the plantsite of Weyerhaeuser Co. at Cottage Grove, Oreg., and from Eugene and Springfield, Oreg., to points in California, Idaho, Montana, Nevada, Utah, and Washington, under a continuing contract, or contracts, with Weyerhaeuser Co. of Tacoma, Wash. By the instant petition, petitioner seeks to add to its already existent authority service for Cheney Lumber Company of Eugene, Oreg. In addition, petitioner seeks a permit authorizing operation, in interstate or foreign commerce, as a contract carrier by motor vehicle, over irregular routes, of laminated wood products and prefabricated wooden timbers and trusses, laminated wooden beams, timbers, and arches, laminated wooden decking, lumber, timbers, millwork, panels, boards and sheets, and hardware used in the installation thereof when moving with same from the plantsite of Eugene, Oreg., to points in Washington, Oregon, Idaho, Montana, Wyoming, California, Nevada, Utah, Colorado, New Mexico, and Arizona. Any person or persons desiring to participate may file an original and six copies of his written representations, views, or arguments in support of or against the petitions within 30 days from the date of publication in the FEDERAL REGISTER.

APPLICATIONS UNDER SECTIONS 5 AND 210a(b)

The following applications are governed by the Interstate Commerce Commission's special rules governing notice of filing of applications by motor carriers of property or passengers under sections 5(a) and 210a(b) of the Interstate Commerce Act and certain other proceedings with respect thereto (49 CFR 1.240).

MOTOR CARRIERS OF PROPERTY

No. MC-F-11658. Authority sought for control and merger by PUROLATOR SECURITY SERVICES, INC., 1341 West Mockingbird Lane, Dallas, TX 75202, of the operating rights and properties of (1) ARMORED MOTOR SERVICE OF ARIZONA, INCORPORATED, 712 East Roosevelt Street, Phoenix, AZ 85006; (2) BONDED ARMORED CARRIER, INC., 810 Old Harford Road, Baltimore, MD 21234; (3) PROTECTIVE MOTOR SERVICE COMPANY, INC., 725-29 South Broad Street, Philadelphia, PA 19147; and (4) MERCER & DUNBAR ARMORED CAR SERVICE, INC., doing business as DAS, 75 Maxim Road, Hartford, CT 06101, and for acquisition by AMERICAN COURIER CORPORATION and in turn by PUROLATOR SERVICES, INC., both of 2 Nevada Drive, Lake Success, NY 11040, of control of such rights and properties through the transaction. Applicant's attorneys: John M. Delany, 2 Nevada Drive, Lake Success, NY 11040 and Russell S. Bernhard, 1625 K Street NW., Washington, DC 20006. Operating rights sought to be controlled and merged: (1) *Coin, currency, securities, and valuables,* in armored or armed guard car service, as a contract carrier, over irregular routes, between points in Arizona; and *coin, currency, and securities,* between Los Angeles, Calif., on the one hand, and, on the other, points in Arizona. (Restricted to service under a continuing contract or contracts with named banks); (2) *cash, coin, currency, and negotiable and nonnegotiable securities* (excluding cash letters and accompanying checks), in armored vehicles, as a *contract carrier,* over irregular routes, between Baltimore, Md., on the one hand, and, on the other, points in Mineral, Hampshire, Berkeley, Morgan, and Jefferson Counties, W. Va., and Accomack and Northampton Counties, Va.; and *cash, coin, currency, and negotiable and nonnegotiable securities* (excluding cash letters and accompanying checks), in armored vehicles, between Baltimore, Md., on the one hand, and, on the other, certain specified points in West Virginia; (3) *articles of unusual value,* as a *contract carrier,* over irregular routes, between Philadelphia, Pa., on the one hand, and, on the other, points in New Jersey and Delaware within 75 miles of the City Hall, Philadelphia; *coin,* between Atlanta, Ga., Baltimore, Md., Birmingham, Ala., Boston, Mass., Buffalo and New York, N.Y., Charlotte, N.C., Cleveland and Cincinnati, Ohio, Jacksonville, Fla., Memphis and Nashville, Tenn., Philadelphia and Pittsburgh, Pa., Richmond, Va., and Washington, D.C.; *bullion* (a) from New York, N.Y., to Philadelphia, Pa., and Fort Knox, Ky., and (b) from Fort Knox, Ky., to Philadelphia, Pa.; *coin,* between Atlanta, Ga., Baltimore, Md., Birmingham, Ala., Boston, Mass., Buffalo, N.Y., Charlotte, N.C., and Cincinnati and Cleveland, Ohio, Detroit, Mich., Denver, Colo., Jacksonville, Fla., Memphis and Nashville, Tenn., New York, N.Y., Philadelphia and Pittsburgh, Pa., Richmond, Va., and Washington, D.C.; *bullion,* between Fort Knox, Ky., New York, N.Y., Denver, Colo., Philadelphia, Pa., and West Point, N.Y., *checks, coupons, and all types of bank papers and bank records,* between Philadelphia, Pa., on the one hand, and, on the other, points in New Jersey (except points in Bergen, Essex, Hudson, Morris, Passaic, and Union Counties) and Delaware, within 75 miles of City Hall, Philadelphia, Pa. (restricted to service under a continuing contract, or contracts, with banks or banking institutions); *commercial papers, documents, written instruments and business records of banks and banking institutions* (except currency and negotiable securities) as are used in the business of banks and banking institutions between Harrisburg, Pa., on the one hand, and, on the other, Baltimore, Md. (restricted to service under a continuing contract, or contracts, with persons engaged in business as banks or banking institutions); (a) *metal articles, foreign coin, and jewelry,* and (b) *materials* used in the production of the commodities described in (a) above, between the Franklin Mint, at Wawa, Pa., on the one hand, and, on the other, Atlanta, Ga., Baltimore, Md., Boston, Mass., Carteret, Newark and Perth Amboy, N.J., Chicago, Ill., Denver, Colo., Fairfield, Conn., Walllace and Kellogg, Idaho, Los Angeles, Calif., Mount Vernon, Niagara Falls, Rouses Point, and New York, N.Y., Philadelphia, Pa., and Washington, D.C. (restricted to service under a continuing contract or contracts, with the Franklin Mint of Wawa, Pa.); food coupons, between Washington, D.C., on the one hand, and, on the other, points in the United States (restricted to service under a continuing contract, or contracts, with General Services Administration of Washington, D.C.); and *exposed and processed film and prints, complimentary replacement film, incidental dealer handling supplies, and advertising literature moving therewith* (except motion picture film used primarily for commercial theater and television exhibition), as a *common carrier,* over irregular routes, between Philadelphia, Pa., on the one hand, and, on the other, certain specified points in Pennsylvania; and (4) *bullion,* as a *contract carrier,* over irregular routes, from West Point, N.Y., to Philadelphia, Pa. (restricted to service under a continuing contract, or contracts, with agencies of the U.S. Government); *bank bills, bonds, negotiable and nonnegotiable securities, drafts, and other valuable papers,* except cash letters and checks moved therewith, in armored car service, between New York, N.Y., on the one hand, and, on the other, Philadelphia, Pa., Baltimore, Md., and Washington, D.C. (restricted to service under a continuing contract, or contracts, with banks or banking institutions); *bank bills, negotiable and nonnegotiable securities, notes, drafts, and other valuable papers,* between points in Connecticut, Massachusetts, New Jersey, New York, and Rhode Island (with restrictions as to commodity and territory), and *such commodities,* except those specified immediately above, *as require special protection by guard and armored cars,* between Hartford, Conn., on the one hand, and, on the other, Boston, Mass., and New York, N.Y. PUROLATOR SECURITY SERVICES, INC., is authorized to operate as a *contract carrier* in Texas, Oklahoma, Louisiana, Arkansas, Colorado, and Tennessee. Application has not been filed for temporary authority under section 210a(b).

NOTE: Applicants state that each of the carriers above named, including PUROLATOR SECURITY SERVICE, INC., are wholly owned subsidiaries of AMERICAN COURIER CORPORATION operated under common control approved by the Commission. The purpose of the instant transaction is to comply with the directive of the Commission in Docket No. MC-F-11004, requiring corporate simplification. The instant application is a matter directly related to MC-F-11680.

No. MC–F–11680. Authority sought for merger by (A) AMERICAN COURIER CORPORATION, 2 Nevada Drive, Lake Success, NY 11040, of the operating rights and properties of (1) INDEPENDENT DELIVERY, INC., 100 South Weller Street, Seattle, WA 98104; (2) OKLAHOMA ARMORED CAR, INC., 1005 SW., Second Street, Oklahoma City, OK 73125; and (3) SECURITIES TRANSPORT COMPANY, INC., 712 East Roosevelt Street, Phoenix, AZ 85006; and (B) for purchase by AMERICAN COURIER CORPORATION of a portion of the operating rights of (4) COLORADO ARMORED SERVICE COMPANY, 5275 Quebeck Street, Commerce City, CO 80022, and for acquisition by PUROLATOR SERVICES, INC., 2 Nevada Drive, Lake Success, NY 11040, of control of such rights and properties through the transaction. Applicant's attorneys: John M. Delany, 2 Nevada Drive, Lake Success, NY 11040 and Russell S. Bernhard, 1625 K Street NW., Washington, DC 20006. Operating rights sought to be merged: (1) *Toilet and drug preparations, medicines, prescriptions and ingredients thereof, and drug store displays*, as a *common carrier*, over irregular routes, between Seattle and Tacoma, Wash., on the one hand, and, on the other, certain specified points in Washington; *general commodities*, excepting among others, classes A and B explosives, household goods and commodities in bulk, from Seattle, Wash., to certain specified points in Washington; *electrical parts and controls, photographic and recording supplies, and replacement parts* for automobiles, tractors, and construction equipment, and tractor and construction equipment attachments, between points in King, Mason, Pierce, Snohomish, and Thurston Counties, Wash., on the one hand, and, on the other, certain specified points in Oregon; and *business records* as are used in the business of banks and banking institutions, *exposed and processed film and prints, complimentary replacement film, incidental dealer handling supplies, and advertising literature* moving therewith (except motion picture film used primarily for commercial theater and television exhibition), and *medical supplies*, between points in King, Mason, Pierce, Snohomish, and Thurston Counties, Wash., on the one hand, and, on the other, certain specified points in Oregon (with restrictions);

(2) in pending Docket No. MC–129442 (Sub–No. 3), *commercial papers, documents, written instruments and business records* (except currency and negotiable securities) as a *contract carrier*, over irregular routes, between Tulsa, Okla., and certain specified points in Missouri, and Kansas, pursuant to a continuing contract with persons engaged in the business of banks or banking institutions; in pending Docket No. MC–129442 (Sub–No. 4) *commercial papers, documents, written instruments and business records* (except currency, coins, bullion and negotiable instruments) as are used in the business of banks and banking institutions, between Wichita Falls and Dallas, Tex., on the one hand, and, on the other, points in Oklahoma (restricted to a service under a continuing contract with persons engaged in the business of banks or banking institutions); in pending Docket No. MC–135320 (Sub–No. 1) *audit media and business records* (except cash letters), as a *common carrier*, over irregular routes, between Dallas, Tex., on the one hand, and, on the other, points in Oklahoma; *unprocessed film*, from points in Oklahoma to Dallas and San Antonio, Tex.; *processed film and prints, complimentary replacement film, incidental dealer handling supplies and advertising material* moving therewith (except motion picture film used primarily for commercial theater and television exhibition) from Dallas and San Antonio, Tex., to points in Oklahoma; and *radiopharmaceuticals, radioactive drugs, and medical isotopes*, between Dallas and Houston, Tex., on the one hand, and, on the other, points in Oklahoma; and in pending Docket No. MC–135320 (Sub–No. 3) *audit media and other business records* (except as used in the business of banks and banking institutions), *radiopharmaceuticals, radioactive drugs, and medical isotopes*, and medical instruments and replacement parts, between points in Oklahoma; and

(3) *exposed and processed film and prints, complimentary replacement film, incidental dealer handling supplies and advertising literature*, moving therewith and *microfilm*, as a *common carrier*, over irregular routes, between Phoenix, Ariz., on the one hand, and, on the other, points in Arizona; business records and reports, payroll checks, data processing records and utility meter books, between Phoenix, Ariz., on the one hand, and, on the other, points in Arizona (except Navajo and Apache Counties); and *radiopharmaceuticals, radioactive drugs, and medical isotopes, proofs, cuts, copy, artwork and materials related thereto*, used in advertising, *small parts* used in the manufacture, replacement and servicing of computer, calculator, typewriter, and photo reproduction equipment; *bank checks, binders, check books, registers and other bank stationery*, between points in Arizona (with restrictions). Operating rights sought to be transferred:

(4) *Business papers, records, and audit accounting media; exposed and processed film and prints, replacement film, camera replacement parts* (except motion picture film used primarily for commercial theater and television exhibition); *Dentistry materials and supplies; Opthalmic goods and order forms; prescription pharmaceuticals, radiopharmaceuticals, medical isotopes, narcotics, biological specimens and related records, and exposed X-ray films and materials;* and *replacement parts* for computers, data processing equipment, photocopy equipment and office machines; between Stapleton Airport in Denver, Colo., and Preston Field Airport near Colorado Springs, Colo., on the one hand, and, on the other, certain specified points in Colorado (with restrictions). AMERICAN COURIER CORPORATION is authorized to operate as a *common carrier*, in Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, Pennsylvania, New York, Iowa, Illinois, Nebraska, Kentucky, Tennessee, Ohio, West Virginia, Rhode Island, Michigan, Indiana, Maryland, Virginia, Delaware, Wisconsin, Missouri, Minnesota, North Dakota, South Dakota, Kansas, North Carolina, Texas, Arkansas, Mississippi, Oklahoma, Florida, South Carolina, California, and the District of Columbia and as a contract carrier in New York, New Jersey, Connecticut, Pennsylvania, West Virginia, Ohio, Massachusetts, Delaware, Virginia, Maryland, Louisiana, Rhode Island, Iowa, Missouri, Illinois, Indiana, Maine, Kentucky, Minnesota, Wisconsin, New Hampshire, Nebraska, Vermont, Michigan, South Dakota, North Dakota, North Carolina, Alabama, Georgia, Tennessee, South Carolina, Texas, Mississippi, Oklahoma, and Florida. Application has not been filed for temporary authority under section 210a(b).

NOTE: Applicants state that each of the above-named carriers are wholly owned subsidiaries of AMERICAN COURIER CORPORATION. The purpose of the instant transaction is to comply with the Commission directive in Docket No. MC–F–11004, requiring corporate simplification. The instant application is a matter directly related to MC–F–11658.

No. MC–F–11681. Authority sought for control by ORSCHELN BROS. TRUCK LINES, INC., Highway 24 East, Moberly, Mo. 65270, of H. R. RINKER TRANSFER & STORAGE CO., 109 North Chestnut Street, Taylorville, IL 65268, and for acquisition by HAROLD W. ORSCHELN, 510 Hafner, Hannibal, MO 63401, EDWARD G. ORSCHELN, 526 West Carpenter, Moberly, MO 65270, GEORGE A. VITT, 530 East Rollins, Moberly, MO 65270, FRANCIS J. ORSCHELN, 601 Shumate, Moberly, MO 65270, ELMER A. ORSCHELN, 811 Gilman, Moberly, MO 65270, LOUIS H. LUTH, 1416 Boonslick Road, St. Charles, MO 64114, A. G. ORSCHELN, 301 West 116th Street, Kansas City, MO 64114, T. B. ORSCHELN, 7467 Overbrook Drive, St. Louis, MO 63121, EDWARD J. ORSCHELN, R.F.D. No. 1, Moberly, Mo. 65270, and MARILYN J. CORRIGAN, 1573, Chastham Drive, Creve Coeur, MO 63141, of control of H. R. RINKER TRANSFER & STORAGE CO., through the acquisition by ORSCHELN BROS. TRUCK LINES, INC. Applicants' attorney: Gregory M. Rebman, 1230 Boatmen's Bank Building, St. Louis, Mo. 63102. Operating rights sought to be controlled: *General commodities*, excepting among others, dangerous explosives, household goods and commodities in bulk, as a *common carrier* over regular routes, between St. Louis, Mo., and points in Illinois; *general commodities*, excepting among others, classes A and B explosives, household goods, and commoplosives, household goods, and commodities in bulk, serving the plantsite of the Hussmann Refrigerator Co., located at Taussig Road and St. Charles

Rock Road, Bridgeton, Mo., as an off-route point in connection with carrier's presently authorized regular-route operations: *packinghouse products*, over irregular routes, from St. Louis, Mo., and East St. Louis, Ill., to certain specified points and places in Illinois, between St. Louis, Mo., and East St. Louis, Ill., on the one hand, and, on the other, Chicago, Ill.; *fresh meats and packinghouse products*, from Taylorville, Ill., to certain specified points and places in Illinois. ORSCHELN BROS. TRUCK LINES, INC., is authorized to operate as a common carrier in Missouri, Illinois, Iowa, Kansas, Arkansas, Indiana, Michigan Minnesota, Nebraska, North Dakota, Oklahoma, South Dakota, Texas, and Wisconsin. Application has been filed for temporary authority under section 210a(b).

No. MC-F-11682. Authority sought for purchase by U.S. TRUCK COMPANY, INC., 2290 24th Street, Detroit, MI 48216, of a portion of the operating rights and property of TRANSPORTATION SERVICE, INC., 2021 South Schaefer, Detroit, MI 48217, and for acquisition by GEORGE J. CODD, DONALD A. WARD, ROBERT D. JONES, and B. JAMES THEODOROFF, all of Detroit, Mich. 48216, and WILBER M. BRUCKER, Jr., 38th Floor Penobscot Building, Detroit, Mich. 48226, of control of such rights and property through the purchase. Applicants' attorneys: David Axelrod, 39 South LaSalle Street, and Wilber M. Buckner, Jr., 38th Floor Penobscot Building, Detroit, Mich. 48226. Operating rights sought to be transferred: *General commodities*, excepting among others, classes A and B explosives, household goods, and commodities in bulk, as a *common carrier* over regular routes, between Toledo and Cincinnati, Ohio, serving all intermediate points, between Toledo and Cincinnati, Ohio, over two routes generally via Wapakoneta and Dayton, Ohio, and another route via Columbus, Springfield, and Xenia, Ohio, serving most intermediate and various off-route points, between Wapakoneta and Lancaster, Ohio, serving various intermediate and off-route points, between Fosteria and Springfield, Ohio, serving various intermediate and off-route points, between Carey and Springfield, Ohio, serving various intermediate and off-route points, serving the site of the Feeds Materials Production Center of the U.S. Atomic Energy Commission near Fernald, Ohio, as an off-route point in connection with carriers otherwise regular route operations to and from Cincinnati, Ohio. Vendee is authorized to operate as a *common carrier* in Michigan and Ohio. Application has been filed for temporary authority under section 210a(b).

No. MC-F-11683. Authority sought for purchase by WILSON FREIGHT COMPANY, 3636 Follett Avenue, Cincinnati, OH 45223, of a portion of the operating rights and property of TRANSPORTATION SERVICE, INC., 2021 South Schaefer, Detroit, MI 48217, and for acquisition by DAVID M. GANTZ, JOSEPH M. GANTZ, S. DAVID SHOR, and JOHN SHORE, all of Cincinnati, Ohio 45223, of control of such rights and property through the purchase. Applicants' attorneys: David Axelrod, 39 South LaSalle Street, Chicago, IL 60603, and Milton H. Bortz, 3636 Follett Avenue, Cincinnati, OH 45223. Operating rights sought to be transferred: *General commodities* excepting among others, classes A and B explosives, household goods, and commodities in bulk, as a *common carrier*, over regular routes, serving most intermediate and various off-route points in connection with carrier's presently authorized regular route operations to and from Detroit and Pontiac, Mich., between Flint, Mich., and Toledo, Ohio, serving all intermediate points, and serving points within 5 miles of Detroit, Mich., as intermediate or off-route points, between Detroit, Mich., and Willow Run, Mich., serving the intermediate point of Wayne, Mich., between the junction of U.S. Highway 25 and Michigan Highway 17 and Willow Run, Mich., with no service at intermediate points, serving an off-route point, in connection with carrier's regular route operations to and from Detroit, Mich., and the commercial zone thereof, between Toledo, Ohio, and Detroit, Mich., as an alternate route for operating convenience only, in connection with carrier's presently authorized regular-route operations, serving no intermediate points, and serving junction U.S. Highways 23 and 12 and junction Interstate Highway 94 and U.S. Highway 12 for purposes of joinder only, between junction U.S. Highways 23 and 12 and junction U.S. Highway 12 and Interstate Highway 94, as an alternate route for operating convenience only, in connection with carrier's presently authorized regular-route operations, serving no intermediate points, and serving junction U.S. Highways 23 and 12 and junction Interstate Highway 94 and U.S. Highway 12 for purposes of joinder only. Vendee is authorized to operate as a *common carrier* in Connecticut, New Jersey, New York, Pennsylvania, Ohio, Maryland, Massachusetts, West Virginia, District of Columbia, North Carolina, Virginia, Rhode Island, Indiana, Kentucky, Tennessee, Illinois, Minnesota, Wisconsin, Missouri, Iowa, Delaware, Maine, New Hampshire, Vermont, Oklahoma, and Kansas. Application has been filed for temporary authority under section 210a(b).

No. MC-F-11688. Authority sought for control and merger by Murphy Motor Freight Lines, Inc., 2323 Terminal Road, St. Paul, MN 55113, of the operating rights and properties of Werner Continental, Inc., 2500 West County Road C, Roseville, MN 55113, and for acquisition by Edward L. Murphy, Jr., 2323 Terminal Road, St. Paul, MN 55113, and Stanley L. Wasie, 2323 Terminal Road, St. Paul, MN 55113, of control of such rights and property through the purchase. Applicants' attorneys: David Axelrod, 39 South La Salle Street, Chicago, IL 60603; Thomas Feinberg, 33 South Fifth Street, Minneapolis, MN 55402; and Joseph Maun, 332 Hamm Building, St. Paul, MN 55102. Werner Continental, Inc., operates as a *common carrier* of general commodities with the usual exceptions primarily over regular routes, extending between Minneapolis-St. Paul, Minn., on the west, Cincinnati, Ohio, on the south, and Baltimore, Md., New York, and Boston, Mass., on the east serving to, from, and between specified points in the States of Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan, Ohio, Kentucky, West Virginia, Pennsylvania, New York, Virginia, Maryland, New Jersey, Connecticut, Rhode Island, Massachusetts, and the District of Columbia. MURPHY MOTOR FREIGHT LINES, INC., is authorized to operate as a *common carrier* in New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Iowa, Wisconsin, Minnesota, North Dakota, South Dakota, and Nebraska. Application has not been filed for temporary authority under section 210a(b).

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17765 Filed 10-17-72;8:50 am]

[Notice 142]

MOTOR CARRIER TRANSFER PROCEEDINGS

OCTOBER 13, 1972.

Application filed for temporary authority under section 210a(b) in connection with transfer application under section 212(b) and transfer rules, 49 CFR Part 1132:

No. MC-FC-74017. By application filed October 10, 1972, JOE DOCTORMAN AND SON, INC., 2900 South Second West, Salt Lake City, UT 84115, seeks temporary authority to lease the operating rights of GLEN JENSEN, doing business as GLEN PRODUCE CO., Maurine B. Jensen, Administratrix of the Estate, 2474 Redondo Avenue, Salt Lake City, UH 84108, under section 210a(b). The transfer to JOE DOCTORMAN AND SON, INC., of the operating rights of GLEN JENSEN, doing business as GLEN PRODUCE CO., Maurine B. Jensen, Administratrix of the Estate, is presently pending.

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17767 Filed 10-17-72;8:51 am]

NOTICE OF FILING OF MOTOR CARRIER INTRASTATE APPLICATIONS

OCTOBER 13, 1972.

The following applications for motor common carrier authority to operate in intrastate commerce seek concurrent motor carrier authorization in interstate or foreign commerce within the limits of the intrastate authority sought, pursuant to section 206(a)(6) of the Interstate Commerce Act, as amended October 15, 1962. These applications are governed by special rule 1.245 of the Commission's rules of practice, published in the FEDERAL REGISTER, issue of April 11, 1963, page 3533, which provides, among other things, that protests and requests for information concerning the time and place of State Commission hearings or other proceedings, any subsequent changes therein, any other related matters shall be directed to the State Commission with which the application is filed and shall not be addressed to or filed with the Interstate Commerce Commission.

Montana docket number unknown, filed October 2, 1972. Applicant: M. G. BOSTWICK, doing business as BOSTWICK TRUCK LINES, 710 South Pacific Street, Dillon, MT 59725. Certificate of public convenience and necessity sought to operate a freight service as follows: Transportation of *general commodities:* (1) Between Dillon, Mont., and Billings, Mont., serving all intermediate and off-route points, over Highways 41, 287, Interstate 90 (U.S. 10). (2) Between Butte, Mont., and Missoula, Mont., serving all intermediate and off-route points over Interstate 90 (U.S. 10). Limitations: Transportation of petroleum or petroleum products in bulk in tank vehicles is prohibited. Transportation of livestock is prohibited. Transportation of commodities requiring special equipment is prohibited. Both intrastate and interstate authority sought. *HEARING:* Date, time, and place unknown. Requests for procedural information including the time for filing protests concerning this application should be addressed to the Montana Public Service Commission, 1227 11th Avenue, Helena, MT 59601, and should not be directed to the Interstate Commerce Commission.

Oklahoma Docket No. MC 24296 (Sub-No. 1), filed October 9, 1972. Applicant: JIM REDWINE, 600 West Broadway, Kingfisher, OK. Applicant's representative: G. Timothy Armstrong, 280 National Foundation Life Building 3535 Northwest 58th Street, Oklahoma City, OK. Certificate of public convenience and necessity sought to operate a freight service as follows: Transportation of *Iron and steel articles,* between the Port of Muskogee, Okla., on the one hand, and all points within the State of Oklahoma, on the other. Both intrastate and interstate authority sought.

HEARING: November 27, 1972, 9 a.m., Third Floor, Jim Thorpe Office Building, Oklahoma City, Okla. Requests for procedural information including the time for filing protests concerning this application should be addressed to the Oklahoma Corporation Commission, Jim Thorpe Office Building, Oklahoma City, Okla. 73501, and should not be directed to the Interstate Commerce Commission.

Alabama Docket No. 16632, filed September 25, 1972. Applicant: JACK PHILLIPS, Post Office Box 141, Little River, AL 36550. Applicant's representative: Thomas A. Johnston, III, Post Office Box 1643, Mobile, AL 36601. Certificate of public convenience and necessity sought to operate a freight service as follows: Transportation of (1) *Commodities generally,* except articles injurious to other lading such as explosives, property requiring special equipment, etc., over regular routes; namely, (a) between Mobile, Ala., and Evergreen, Ala., over U.S. Highway No. 31 and (b) between Bay Minette, Ala., and Evergreen, Ala., as follows: Commencing at Bay Minette, thence over State Highway No. 59 to Uriah, thence over State Highway No. 11 to Frisco City, thence over U.S. Highway No. 84 to Evergreen. Off-route points: Claiborne, Perdue Hill, Mexia, Monroeville, Goodway, Husford, McCullough, Littie, Rabun, Robinsville, Sardine, Range, Daphne, and Loxley, and (2) *Household goods,* over irregular routes in south Alabama bound on the north by U.S. Highway No. 80; east by the Alabama-Georgia State line; south by the Alabama-Florida State line and west by the Mississippi-Alabama State line. From Monroeville over State Highway No. 47 to Beatrice, thence over unnumbered highway through Corduroy and Vredenburg to Hybart, Ala., and return over the same route, serving all intermediate points. Both intrastate and interstate authority sought.

HEARING: Contact Alabama Public Service Commission. Requests for procedural information including the time for filing protests concerning this application should be addressed to the State of Alabama, Alabama Public Service Commission, Post Office Box 991, Montgomery, AL 36102, and should not be directed to the Interstate Commerce Commission.

By the Commission.

[SEAL] ROBERT L. OSWALD,
Secretary.

[FR Doc.72-17762 Filed 10-17-72;8:50 am]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Health Services and Mental Health Administration

NATIONAL ADVISORY COMMITTEES

Announcement of Meetings and Cancellation During the Month of October 1972

Pursuant to Executive Order 11671, the Administrator, Health Services and Mental Health Administration, announces the meeting dates and other required information for the following national advisory bodies scheduled to assemble during the month of October 1972, in accordance with provisions set forth in section 13(a) (1) and (2) of that Executive Order:

Committee name, date, time, place, type of meeting and/or contact person

U.S. National Committee on Vital and Health Statistics, October 19 and 20, 9:30 a.m., Room 200, Brookings Institution, Washington, D.C., Open, Contact Mrs. Jean Peterson, Room 9A-54, Parklawn Building, 5600 Fishers Lane, Rockville, Md., Code 301—443-1068.

Purpose: To delineate statistical problems on public health importance which are of national or international interest; review findings submitted by other organizations and agencies, and make recommendations for national and/or international adoption; cooperate with and advise other organizations on matters relating to vital and health statistics in the U.S., national committees of other countries, and the world Health Organization, in the study of problems of mutual interest.

Agenda: Agenda items will include the status of subcommittees, working parties and technical consultant panels in the areas of ambulatory medical care records, Ninth Revision of the International Classification of Diseases and hospital discharge abstracts. Items to be discussed include current activities in relation to health indicators, Health Services, and Mental Health Administration evaluation of the National Center for Health Statistic's "health data Strategy" and evaluation of proposed technical consultant panels concerning social indicators, needed statistics and data systems for formulation of national population policies and analytical potentialities.

Committee name, date, time, place, type of meeting and/or contact person

Regional Health Advisory Committee, Region I, October 26-27, 9:30 a.m., Conference Room 1507, John F. Kennedy Federal Building, Boston, Mass., Open, Contact—Natalie Freeman, John F. Kennedy Federal Building, Boston, Mass., Code 617—223-6255.

Purpose: Provides advice and guidance to the Regional Health Director on Regional health policies, programs, and plans. Reviews studies, and deliberates on those major health and health-related problems and opportunities which confront the Region.

Agenda: The Committee will update the health planning conference; conduct an in-depth review of Comprehensive Health Planning in Southern Maine agency presentation; discuss the task force report on health planning program evaluation strategies; and discuss the future role of the Regional Health Advisory Committee in Regional Health policy development.

Public Health Conference on Records and Statistics—Standing Committee, October 26-27, 1:30 p.m., Board Room, Sheraton Silver Spring Motor Inn, 8727 Colesville Road, Silver Spring, MD, Open, Contact—Mary Lou Dundon, Room 9A-19, Parklawn Building, 5600 Fishers Lane, Rockville, MD, Code 301—443-1470.

Purpose: To advise and make recommendations on the Public Health Conference on Records and Statistics, a study program in the National Center for Health Statistics which fosters the development of improved techniques and concepts in vital records and health statistics in the United States. Investigates current and future problems and develops recommendations for practical solutions, with a view to improved services to health programs, the public, and the Nation.

Agenda: Items will cover Report of the Director, National Center for Health Statistics on the evaluation of the program, components and recent developments of the Federal-State-local health statistics system; future meetings of the Committee; report on identifying health service scarcity area in the United States and other technical studies.

Committee name, date, time, place, type of meeting and/or contact person

Board of Scientific Counselors, NIMH, October 27, 9:30 a.m., NIH Animal Center, Poolesville, Md., October 28, 9 a.m., Building 36, Room 1B–07, National Institutes of Health, Bethesda, Md., October 27, 9:30–10:30 a.m., Open, October 27, 10:30 through end of Meeting, Closed Contact, John C. Eberhart, Room 1A–05, Building 36, National Institutes of Health, Bethesda, Md., Code 301–496–3501.

Purpose: Provides expert advice to the Director, National Institute of Mental Health, on the mental health intramural research program through periodic visits to the laboratories for assessment of the research in progress and evaluation of productivity and performance of staff scientists.

Agenda: The Board will meet in the Library of Building 110 at Poolesville and be open to the public for approximately 1 hour for a report by the Director, Intramural Research, NIMH, on recent administrative developments. The remainder of the 2-day session will be devoted to the review of intramural research projects and evaluation of productivity and performance of the scientists. This portion will be closed in accordance with section 1 of the determination by the Secretary of Health, Education, and Welfare pursuant to the provisions of Executive Order 11671, Section 13(d).

Cancellation:

Regional Health Advisory Committee, Region VII, October 26 and 27, 9 a.m., Glenwood Manor, Overland Park, Kans.

Items for discussion are subject to change due to the priorities as directed by the President of the United States, or the Secretary of Health, Education, and Welfare.

A roster of members may be obtained from the contact person listed above.

Dated: October 16, 1972.

Andrew J. Cardinal,
Acting Associate Administrator for Management, Health Services and Mental Health Administration.

[FR Doc.72–17869 Filed 10–17–72;8:51 am]

Office of Education

VOCATIONAL EDUCATION

Establishment of Closing Date for Receipt of Applications for Exemplary Programs and Projects; Fiscal Year 1973 Funds

The Vocational Education Act of 1963, Public Law 88–210, as amended by Public Law 90–576, Title I, provides for educational programs designed to stimulate new ways to create a bridge between school and earning a living for young people, who are still in school, who have left school either by graduation or by dropping out, or who are in postsecondary programs of vocational preparation, and to promote cooperation between public education and manpower agencies; and to broaden occupational aspirations and opportunities for youths, with special emphasis given to youths who have academic, socioeconomic, or other handicaps. Section 142(c) of Part D of Public Law 90–576 authorizes the U.S. Commissioner of Education, from 50 percent of the sums allotted to each State for the purposes of this part, to make grants to or contracts with State boards or local educational agencies for the purpose of stimulating and assisting in the development, establishment, and operation of programs or projects designed to carry out the purposes of this part.

The Commissioner may also make, in such State from such sums:

(1) Grants to other public or nonprofit private agencies, organizations, or institutions; or

(2) Contracts with public or private agencies, organizations, or institutions, when such grants or contracts will make an especially significant contribution to achieving the objectives of this part.

Grants or contracts pursuant to this part may be made, upon terms and conditions consistent with the provisions of this part, to pay all or part of the cost of:

(1) Planning and developing exemplary programs or projects,

(2) Establishing, operating, or evaluating exemplary programs or projects designed to carry out the purposes set forth in this part.

Applications may be submitted to the U.S. Commissioner of Education for grants or contracts for exemplary programs and projects in accordance with the applicable rules and regulations contained in Federal Register, Vol. 35, No. 143. Eligible applications for FY 1973 must be postmarked no later than December 16, 1972, and will be considered competitively with other applications from a given State.

Suggested guidelines and instructions for the development of proposals may be obtained from the Bureau of Adult, Vocational, and Technical Education, U.S. Office of Education, Washington, D.C. 20202.

The above is contingent upon funds being appropriated by the Congress to support section 142(c) activities during fiscal year 1973.

Dated: October 6, 1972.

S. P. Marland, Jr.,
U.S. Commissioner of Education.

[FR Doc.72–17740 Filed 10–17–72;8:50 am]

Office of the Secretary

ADVISORY COMMITTEE ON OLDER AMERICANS; SOCIAL SERVICES SUBCOMMITTEE

Notice of Meeting

The Advisory Committee on Older Americans was established by the Older Americans Act of 1965 for the purpose of advising the Secretary of Health, Education, and Welfare on matters bearing on his responsibilities under this Act and related activities of his Department.

The Social Services subcommittee of the committee will meet on October 19, 9 a.m. to 4 p.m., HEW North Building, Room 3627, 330 Independence Avenue SW., Washington, DC. Representatives of several national voluntary organizations and various HEW offices will provide an overview of the relationships between the government and the voluntary social welfare sector on social services for the elderly. Meeting open to public observation.

Dated: October 11, 1972.

Cleonice Tavani,
Staff Director.

[FR Doc.72–17712 Filed 10–17–72;8:46 am]

CUMULATIVE LIST OF PARTS AFFECTED—OCTOBER

The following numerical guide is a list of parts of each title of the Code of Federal Regulations affected by documents published to date during October.

3 CFR

	Page
PROCLAMATIONS:	
4160	20665
4161	20931
4162	21411
4163	21413
4164	21415
4165	21417
4166	21419
4167	21901
4168	21903
EXECUTIVE ORDERS:	
11671 (amended and superseded by EO 11686)	21421
11686	21421
11687	21479

4 CFR

PROPOSED RULES:	
331	21177
404	20956

5 CFR

175	21925
213	21149, 21481, 21987
890	20667
2411	20668
2470	20671
2471	20671

6 CFR

101	20949
201	21306
202	21306
300	20828, 21440, 21943
305	20950
Rulings	20829–20837, 21481, 21987

7 CFR

51	21423
52	21155
722	21988
864	21795
874	21533
905	21799
906	21800, 21801
908	20933, 21307, 21536, 21802
910	21157, 21308, 21802
912	21308
928	21537
944	21802
966	21423
980	21424
982	21988
987	21537
1040	20804
1043	20804
1801	21425
1832	21158
1861	21425
1890n	21425
PROPOSED RULES:	
58	21331
319	21444
722	20721, 21642
724	21950
725	21443

7 CFR—Continued

	Page
PROPOSED RULES—Continued	
728	21642
729	21853
730	21173, 21642, 21643
775	21332, 21642
811	21333
906	21947
911	20951
929	20867, 21538
982	21442
984	21443, 22000
989	21538
991	21539
999	21538
1002	22000
1032	21171
1050	20952, 21171
1062	21171, 21641
1064	21171
1065	21171
1071	21821
1073	21821
1097	21821
1099	21332
1102	21821
1104	21821
1106	21821, 21947
1108	21821
1120	21821
1126	21821
1127	21821
1128	21821
1129	21821
1130	21821
1132	21821
1133	21539
1138	21821
1139	20867
1421	21174, 21335
1464	21956
1701	20867, 20952

9 CFR

56	21925
76	20805, 20933, 21277, 21621
82	21427, 21989
92	21149, 21804
94	21149
301	21926
312	21926
327	21927

10 CFR

PROPOSED RULES:	
20	21652
170	20871

12 CFR

1	21622
225	20673, 21938
269	21989
PROPOSED RULES:	
291	22003
545	21178
561	21179
563	21179

13 CFR

	Page
302	21154
PROPOSED RULES:	
308	21646

14 CFR

23	21320
27	21320
39	20673, 21320, 21527, 21528, 21626–21628, 21928
47	21528
71	20674, 20806, 20807, 20934, 21160, 21321, 21427, 21528–21530, 21628, 21804, 21805, 21928–21930
75	20807, 21160, 21530
91	20934, 21990
95	21930
97	20935, 21628
121	20936
169	21321
Ch. II	20807
207	20674
208	20674
212	20674, 20807
214	20675, 20807
217	20675
239	21161
241	20676
249	20676, 20808
297	21805
372a	20808
389	21806
405	21162
PROPOSED RULES:	
39	21444
71	20727, 20871, 20952–20955, 21160, 21174 21175, 21542, 21651, 21853–21856, 21957, 21958
73	21543, 21651, 21856
91	20955
207	21347
208	21347
212	21347
214	21347
239	21175

15 CFR

371	21309
373	21309
376	21310
911	21806

16 CFR

13	21312, 21313, 21315–21318, 21932–21936
600	21319
PROPOSED RULES:	
303	21653

17 CFR

	Page
211	20937
231	20937
241	20937
251	20937
271	20937
PROPOSED RULES:	
239	21445
240	21447, 21958, 22004
249	21445

18 CFR

PROPOSED RULES:	
2	21181
101	21181
104	21181
201	21181
204	21181
260	21544
801	21355

19 CFR

11	20678
12	21804
24	20678
133	20678
PROPOSED RULES:	
22	20951

20 CFR

405	21162, 21428, 21630
722	21429

21 CFR

3	21481, 21630, 21991
19	20937
37	21481
51	21807
121	21150, 21151, 21278, 21905, 21991
135	21630, 21808
135a	20938, 21905
135b	20938, 20939, 21429, 21631, 21632, 21808, 21905
135c	20683, 20939, 21631, 21906
135e	20683, 20939, 21279
135f	21808
135g	20683
141	21302
146c	21906
148i	21809, 21906
148n	21809
148p	21809
148z	21302
164	20685
295	21632, 21633, 21635
PROPOSED RULES:	
10	21102
26	21103
50	21106
51	21112
135	21174
141	20870, 21344
141c	21344
146c	21344
148f	21347
149q	21344
150d	21344
191	22000
295	22001

22 CFR

41	21637

23 CFR

	Page
1	21430, 21809

24 CFR

1914	20940, 21433, 21937
1915	21434, 21938

25 CFR

503	21938
PROPOSED RULES:	
161	21947

26 CFR

1	20686, 20688, 20767, 20799, 21434, 21907, 21991
201	21637
PROPOSED RULES:	
1	20700, 20719, 20853
49	21818
170	21330
201	20838, 22000
250	21330
251	21330
301	20700, 21442, 21818
601	21818

29 CFR

1	21138
5	21138
55	21165
101	21481
102	21481
103	21939
1904	20822, 20823
1910	22102
1913	21303
PROPOSED RULES:	
1902	20728

30 CFR

75	20689
PROPOSED RULES:	
75	21641

32 CFR

1	21482
2	21484
3	21484
4	21490
5	21490
6	21491
7	21492
8	21508
9	21509
12	21514
13	21515
14	21516
15	21516
16	21519
18	21521
19	21524
23	21524
24	21525
26	21525
30	21526
818a	20823
824	20825
1301	20942
1302	20942
1472	20690, 21994
1477	20690
PROPOSED RULES:	
1611	21544
1623	21544

32 CFR—Continued

	Page
PROPOSED RULES—Continued	
1624	21544
1626	21544
1627	21544
1660	21653

33 CFR

1	21481
72	20693
92	21151
173	21396
174	21396
PROPOSED RULES:	
117	21853
175	21262
209	21818

37 CFR

1	21994

38 CFR

3	21436

39 CFR

PROPOSED RULES:	
123	21641

40 CFR

115	21441
123	21441
180	20825, 21151, 21152, 21278, 21995
PROPOSED RULES:	
60	21653
85	20914

41 CFR

1–1	20693
1–3	20693
1–15	20693
5A–1	20693
9–7	21322
9–16	21322
9–53	21322
15–4	21637
101–26	20940
101–32	20941
114–51	20941
PROPOSED RULES:	
60–1	20870
101–19	20958

42 CFR

57	21939

43 CFR

PUBLIC LAND ORDERS:	
1985 (see PLO 5263)	20942
2334 (revoked in part by PLO 5264)	21638
5263	20942
5264	21638

45 CFR

Ch. I	21945
116	20760
131	21436
177	20699
701	21152
1068	21437
1069	21438

46 CFR

31	20826, 21816
71	20626

46 CFR—Continued

Page

91 20826
171 21404
172 21404
173 21404
280 21323

PROPOSED RULES:

24 21264
25 21264
160 21266
390 21335
Ch. IV 21184
547 22003

47 CFR

73 .... 21324, 21996
91 21997
97 .... 21325, 21997

PROPOSED RULES:

2 .... 20872, 21352
21 21543

47 CFR—Continued

Page

PROPOSED RULES—Continued

73 .... 20874, 21353, 21543, 21857
76 21857
81 20729
83 20729
87 20872
97 22002

49 CFR

1 .... 21816, 21943
172 21638
177 21531
192 .... 20694, 20826, 21638, 21816
393 21439
555 20943
571 .... 20695, 21328
1003 21999
1005 20943
1033 .... 20827, 21153, 21532
1201 20696

49 CFR—Continued

Page

1202 20696
1204 20697
1205 20697
1206 20697
1207 20698
1208 20698
1209 20698
1210 20699
1249 20944

PROPOSED RULES:

173 21857
178 21857
571 .... 20956, 21652, 22004

50 CFR

10 .... 20699, 21532
28 21999
32 .... 20828, 20944, 20948, 20949, 21329, 21436, 21639, 21640

FEDERAL REGISTER PAGES AND DATES—OCTOBER

Pages	*Date*	*Pages*	*Date*
20659-20760	Oct. 3	21405-21471	Oct. 11
20761-20923	4	21473-21614	12
20925-21142	5	21615-21787	13
21143-21270	6	21789-21894	14
21271-21404	7	21895-21980	17
		21981-22356	18

federal register

WEDNESDAY, OCTOBER 18, 1972
WASHINGTON, D.C.

Volume 37 ■ Number 202

PART II

THE NATIONAL ARCHIVES OF THE UNITED STATES
1934

DEPARTMENT OF LABOR

■

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

■

OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Title 29—LABOR

Chapter XVII—Occupational Safety and Health Administration, Department of Labor

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Pursuant to authority in sections 6 and 8(g) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1593, 1600; 29 U.S.C. 655, 657) and in Secretary of Labor's Order No. 12–71 (36 F.R. 8754), Part 1910 of Title 29 of the Code of Federal Regulations is hereby revised to read as set forth below. This revision includes amendments through Sept. 22, 1972. The purpose of the revision is (1) to publish fully in one place the present occupational safety and health standards contained therein in order to reflect many changes made during the current year and thereby to improve their usefulness and facilitate their enforcement; (2) to correct a number of typographical and clerical errors in the text of the standards; and (3) to publish indexes with the standards, which are intended to permit quicker access to pertinent standards.

Since this revision does not make any substantive changes in the standards, it is not necessary to provide notice of proposed rulemaking, opportunity for public participation therein, nor any delay in effective date. For the same reason, good cause is found for not following the regular procedure for rulemaking provided in 5 U.S.C. 553 and for making this revision effective immediately.

Signed at Washington, D.C. this 4 day of October 1972.

G. C. Guenther,
Assistant Secretary of Labor.

Subpart A—General

Sec.
1910.1 Purpose and scope.
1910.2 Definitions.
1910.3 Petitions for the issuance, amendment, or repeal of a standard.
1910.4 Amendments to this part.
1910.5 Applicability of standards.
1910.6 Incorporation by reference.

Subpart B—Adoption and Extension of Established Federal Standards

1910.11 Scope and purpose.
1910.12 Construction work.
1910.13 Ship repairing.
1910.14 Shipbuilding.
1910.15 Shipbreaking.
1910.16 Longshoring.
1910.17 Effective dates.
1910.18 Changes in established Federal standards.
1910.19 Asbestos dust.

Subpart C—[Reserved]

Subpart D—Walking—Working Surfaces

1910.21 Definitions.
1910.22 General requirements.
1910.23 Guarding floor and wall openings and holes.
1910.24 Fixed industrial stairs.
1910.25 Portable wood ladders.
1910.26 Portable metal ladders.
Sec.
1910.27 Fixed ladders.
1910.28 Safety requirements for scaffolding.
1910.29 Manually propelled mobile ladder stands and scaffolds (towers).
1910.30 Other working surfaces.
1910.31 Sources of standards.
1910.32 Standards organizations.

Subpart E—Means of Egress

1910.35 Definitions.
1910.36 General requirements.
1910.37 Means of egress, general.
1910.38 Specific means of egress requirements by occupancy. [Reserved]
1910.39 Sources of standards.
1910.40 Standards organizations.

Subpart F—Powered Platforms, Manlifts and Vehicle-Mounted Work Platforms

1910.66 Power platforms for exterior building maintenance.
1910.67 Vehicle-mounted elevating and rotating work platforms.
1910.68 Manlifts.
1910.69 Sources of standards.
1910.70 Standards organizations.

Subpart G—Occupational Health and Environmental Control

1910.93 Air contaminants.
1910.93a Asbestos.
1910.94 Ventilation.
1910.95 Occupational noise exposure.
1910.96 Ionizing radiation.
1910.97 Nonionizing radiation.
1910.98 Effective dates.
1910.99 Sources of standards.
1910.100 Standards organizations.

Subpart H—Hazardous Materials

1910.101 Compressed gases (general requirements).
1910.102 Acetylene.
1910.103 Hydrogen.
1910.104 Oxygen.
1910.105 Nitrous oxide.
1910.106 Flammable and combustible liquids.
1910.107 Spray finishing using flammable and combustible materials.
1910.108 Dip tanks containing flammable or combustible liquids.
1910.109 Explosives and blasting agents.
1910.110 Storage and handling of liquified petroleum gases.
1910.111 Storage and handling of anhydrous ammonia.
1910.112 [Reserved]
1910.113 [Reserved]
1910.114 Effective dates.
1910.115 Sources of standards.
1910.116 Standards organizations.

Subpart I—Personal Protective Equipment

1910.132 General requirements.
1910.133 Eye and face protection.
1910.134 Respiratory protection.
1910.135 Occupational head protection.
1910.136 Occupational foot protection.
1910.137 Electrical protective devices.
1910.138 Effective dates.
1910.139 Sources of standards.
1910.140 Standards organizations.

Subpart J—General Environmental Controls

1910.141 Sanitation.
1910.142 Temporary labor camps.
1910.143 Nonwater carriage disposal systems.
1910.144 Safety color code for marking physical hazards.
1910.145 Specifications for accident prevention signs and tags.
1910.146 [Reserved]
1910.147 Sources of standards.
Sec.
1910.148 Standards organizations.
1910.149 Effective dates.

Subpart K—Medical and First Aid

1910.151 Medical services and first aid.
1910.152 [Reserved]
1910.153 Sources of standards.

Subpart L—Fire Protection

1910.156 Definitions applicable to this subpart.

PORTABLE FIRE SUPPRESSION EQUIPMENT

1910.157 Portable fire extinguishers.
1910.158 Standpipe and hose systems.

FIXED FIRE SUPPRESSION EQUIPMENT

1910.159 Automatic sprinkler systems.
1910.160 Fixed dry chemical extinguishing systems.
1910.161 Carbon dioxide extinguishing systems.
1910.162 Other special fixed extinguishing systems. [Reserved]

OTHER FIRE PROTECTION SYSTEMS

1910.163 Local fire alarm signaling systems.
1910.164 Fire brigades. [Reserved]
1910.165 Effective dates.
1910.165a Sources of standards.
1910.165b Standards organizations.

Subpart M—Compressed Gas and Compressed Air Equipment

1910.166 Inspection of compressed gas cylinders.
1910.167 Safety relief devices for compressed gas cylinders.
1910.168 Safety relief devices for cargo and portable tanks storing compressed gases.
1910.169 Air receivers.
1910.170 Sources of standards.
1910.171 Standards organizations.

Subpart N—Materials Handling and Storage

1910.176 Handling materials—general.
1910.177 Indoor general storage.
1910.178 Powered industrial trucks.
1910.179 Overhead and gantry cranes.
1910.180 Crawler, locomotive, and truck cranes.
1910.181 Derricks.
1910.182 Effective dates.
1910.183 Sources of standards.
1910.184 Standards organizations.

Subpart O—Machinery and Machine Guarding

1910.211 Definitions.
1910.212 General requirements for all machines.
1910.213 Woodworking machinery requirements.
1910.214 Cooperage machinery.
1910.215 Abrasive wheel machinery.
1910.216 Mills and calenders in the rubber and plastics industries.
1910.217 Mechanical power presses.
1910.218 Forging machines.
1910.219 Mechanical power-transmission apparatus.
1910.220 Effective dates.
1910.221 Sources of standards.
1910.222 Standards organizations.

Subpart P—Hand and Portable Powered Tools and Other Hand-Held Equipment

1910.241 Definitions.
1910.242 Hand and portable powered tools and equipment, general.
1910.243 Guarding of portable powered tools.
1910.244 Other portable tools and equipment.
1910.245 Effective dates.
1910.246 Sources of standards.
1910.247 Standards organizations.

Subpart Q—Welding, Cutting and Brazing

1910.251 Definitions.
1910.252 Welding, cutting and brazing.
1910.253 Sources of standards
1910.254 Standards organizations.

Subpart R—Special Industries

1910.261 Pulp, paper, and paperboard mills.
1910.262 Textiles.
1910.263 Bakery equipment.
1910.264 Laundry machinery and operations.
1910.265 Sawmills.
1910.266 Pulpwood logging.
1910.267 Agricultural operations.
1910.268 Sources of standards.
1910.269 Standards organizations.

Subpart S—Electrical

1910.308 Application.
1910.309 National Electrical Code.
Subject Index for 29 CFR 1910—Occupational Safety and Health Standards.

AUTHORITY: The provisions of this Part 1910 issued under secs. 6(a), 8(g), 84 Stat. 1593, 1598; 29 U.S.C. 655, 657.

Subpart A—General

§ 1910.1 Purpose and scope.

(a) Section 6(a) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1593) provides that "without regard to chapter 5 of title 5, United States Code, or to the other subsections of this section, the Secretary shall, as soon as practicable during the period beginning with the effective date of this Act and ending 2 years after such date, by rule promulgate as an occupational safety or health standard any national consensus standard, and any established Federal standard, unless he determines that the promulgation of such a standard would not result in improved safety or health for specifically designated employees." The legislative purpose of this provision is to establish, as rapidly as possible and without regard to the rule-making provisions of the Administrative Procedure Act, standards with which industries are generally familiar, and on whose adoption interested and affected persons have already had an opportunity to express their views. Such standards are either (1) national consensus standards on whose adoption affected persons have reached substantial agreement, or (2) Federal standards already established by Federal statutes or regulations.

(b) This part carries out the directive to the Secretary of Labor under section 6(a) of the Act. It contains occupational safety and health standards which have been found to be national consensus standards or established Federal standards.

§ 1910.2 Definitions.

As used in this part, unless the context clearly requires otherwise:

(a) "Act" means the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1590).

(b) "Assistant Secretary of Labor" means the Assistant Secretary of Labor for Occupational Safety and Health;

(c) "Employer" means a person engaged in a business affecting commerce who has employees, but does not include the United States or any State or political subdivision of a State;

(d) "Employee" means an employee of an employer who is employed in a business of his employer which affects commerce;

(e) "Commerce" means trade, traffic, commerce, transportation, or communication among the several States, or between a State and any place outside thereof, or within the District of Columbia, or a possession of the United States (other than the Trust Territory of the Pacific Islands), or between points in the same State but through a point outside thereof;

(f) "Standard" means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment;

(g) "National consensus standard" means any standard or modification thereof which (1) has been adopted and promulgated by a nationally recognized standards-producing organization under procedures whereby it can be determined by the Secretary of Labor or by the Assistant Secretary of Labor that persons interested and affected by the scope or provisions of the standard have reached substantial agreement on its adoption, (2) was formulated in a manner which afforded an opportunity for diverse views to be considered, and (3) has been designated as such a standard by the Secretary or the Assistant Secretary, after consultation with other appropriate Federal agencies; and

(h) "Established Federal standard" means any operative standard established by any agency of the United States and in effect on April 28, 1971, or contained in any Act of Congress in force on the date of enactment of the Williams-Steiger Occupational Safety and Health Act.

§ 1910.3 Petitions for the issuance, amendment, or repeal of a standard.

(a) Any interested person may petition in writing the Assistant Secretary of Labor to promulgate, modify, or revoke a standard. The petition should set forth the terms or the substance of the rule desired, the effects thereof if promulgated, and the reasons therefor.

(b) (1) The relevant legislative history of the Act indicates congressional recognition of the American National Standards Institute and the National Fire Protection Association as the major sources of national consensus standards. National consensus standards adopted on May 29, 1971, pursuant to section 6(a) of the Act are from those two sources. However, any organization which deems itself a producer of national consensus standards, within the meaning of section 3(9) of the Act, is invited to submit in writing to the Assistant Secretary of Labor at any time prior to February 1, 1973, all relevant information which may enable the Assistant Secretary to determine whether any of its standards satisfy the requirements of the definition of "national consensus standard" in section 3(9) of the Act.

(2) Within a reasonable time after the receipt of a submission pursuant to subparagraph (1) of this paragraph, the Assistant Secretary of Labor shall publish or cause to be published in the FEDERAL REGISTER a notice of such submission, and shall afford interested persons a reasonable opportunity to present written data, views, or arguments with regard to the question whether any standards of the organization making the submission are national consensus standards.

§ 1910.4 Amendments to this part.

(a) The Assistant Secretary of Labor shall have all of the authority of the Secretary of Labor under §§ 3(9) and 6(a) of the Act.

(b) The Assistant Secretary of Labor may at any time before April 28, 1973, on his own motion or upon the written petition of any person, by rule promulgate as a standard any national consensus standard and any established Federal standard, pursuant to and in accordance with section 6(a) of the Act, and, in addition, may modify or revoke any standard in this Part 1910. In the event of conflict among any such standards, the Assistant Secretary of Labor shall take the action necessary to eliminate the conflict, including the revocation or modification of a standard in this part, so as to assure the greatest protection of the safety or health of the affected employees.

§ 1910.5 Applicability of standards.

(a) Except as provided in paragraph (b) of this section, the standards contained in this part shall apply with respect to employments performed in a workplace in a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, Trust Territory of the Pacific Islands, Wake Island, Outer Continental Shelf lands defined in the Outer Continental Shelf Lands Act, Johnston Island, and the Canal Zone.

(b) None of the standards in this part shall apply to working conditions of employees with respect to which Federal agencies other than the Department of Labor, or State agencies acting under section 274 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2021), exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health.

(c) (1) If a particular standard is specifically applicable to a condition, practice, means, method, operation, or process, it shall prevail over any different general standard which might otherwise be applicable to the same condition, practice, means, method, operation, or process. For example, § 1501.23(c)(3) of this title prescribes personal protective equipment for certain ship repairmen working in specified areas. Such a standard shall apply, and shall not be deemed modified nor superseded by any different general standard whose provisions might otherwise be applicable, to the ship repairmen working in the areas specified in § 1915.23(c)(3).

(2) On the other hand, any standard shall apply according to its terms to any employment and place of employment in any industry, even though particular standards are also prescribed for the industry, as in Subpart B or Subpart R of this part, to the extent that none of such particular standards applies. To illustrate, the general standard regarding noise exposure in § 1910.95 applies to employments and places of employment in pulp, paper, and paperboard mills covered by § 1910.261.

(d) In the event a standard protects on its face a class of persons larger than employees, the standard shall be applicable under this part only to employees and their employment and places of employment.

(e) [Reserved]

(f) An employer who is in compliance with any standard in this part shall be deemed to be in compliance with the requirement of section 5(a)(1) of the Act, but only to the extent of the condition, practice, means, method, operation, or process covered by the standard.

§ 1910.6 Incorporation by reference.

(a) The standards of agencies of the U.S. Government and organizations which are not agencies of the U.S. Government which are legally incorporated by reference in this part, have the same force and effect as other standards in this part.

(b) Copies of the standards which are incorporated by reference may be examined at the national office of the Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210, or at any of its regional offices. Copies of such private standards may be obtained from the issuing organizations. Their names and addresses are listed in the pertinent subparts of this part.

(c) Any changes in the standards incorporated by reference in this part and an official historic file of such changes are available for inspection at the national office of the Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210.

Subpart B—Adoption and Extension of Established Federal Standards

§ 1910.11 Scope and purpose.

The provisions of this Subpart B adopt, and extend the applicability of, established Federal standards in effect on April 28, 1971, with respect to every employer, employee, and employment covered by the Act.

§ 1910.12 Construction work.

(a) *Standards.* The standards prescribed in Part 1926 of this chapter are adopted as occupational safety and health standards under section 6 of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in construction work. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed in this paragraph.

(b) *Definition.* For purposes of this section, "construction work" means work for construction, alteration, and/or repair, including painting and decorating. See discussion of these terms in § 1926.13 of this title.

(c) *Construction Safety Act distinguished.* This section adopts as occupational safety and health standards under section 6 of the Act the standards which are prescribed in Part 1926 of this chapter. Thus, the standards (substantive rules) published in Subpart C and the following subparts of Part 1926 of this chapter are applied. This section does not incorporate Subparts A and B of Part 1926 of this chapter. Subparts A and B have pertinence only to the application of section 107 of the Contract Work Hours and Safety Standards Act (the Construction Safety Act). For example, the interpretation of the term "subcontractor" in paragraph (c) of § 1926.13 of this chapter is significant in discerning the coverage of the Construction Safety Act and duties thereunder. However, the term "subcontractor" has no significance in the application of the Act, which was enacted under the Commerce Clause and which establishes duties for "employers" which are not dependent for their application upon any contractual relationship with the Federal Government or upon any form of Federal financial assistance.

§ 1910.13 Ship repairing.

(a) *Adoption and extension of established safety and health standards for ship repairing.* The standards prescribed by Part 1501 of this title and in effect on April 28, 1971, are adopted as occupational safety or health standards under section 6(a) of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in ship repair or a related employment. Each employer shall protect the employment and places of employment of each of his employees engaged in ship repair or a related employment, by complying with the appropriate standards prescribed by this paragraph.

(b) *Definitions.* For purposes of this section:

(1) "Ship repair means any repair of a vessel, including, but not restricted to, alterations, conversions, installations, cleaning, painting, and maintenance work;

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, ship repair work, including, but not restricted to, inspection, testing, and employment as a watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

§ 1910.14 Shipbuilding.

(a) *Adoption and extension of established safety and health standards for shipbuilding.* The standards prescribed by Part 1502 of this title and in effect on April 28, 1971, are adopted as occupational safety or health standards under section 6(a) of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in shipbuilding or a related employment. Each employer shall protect the employment and places of employment of each of his employees engaged in shipbuilding or a related employment, by complying with the appropriate standards prescribed by this paragraph.

(b) *Definitions.* For purposes of this section:

(1) "Shipbuilding" means the construction of a vessel, including the installation of machinery and equipment;

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, shipbuilding work, including, but not restricted to, inspection, testing trials, and employment as a watchman: and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

§ 1910.15 Shipbreaking.

(a) *Adoption and extension of established safety and health standards for shipbreaking.* The standards prescribed by Part 1503 of this title and in effect on April 28, 1971, are adopted as occupational safety or health standards under section 6(a) of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in shipbreaking or a related employment. Each employer shall protect the employment and places of employment of each of his employees engaged in shipbreaking or a related employment, by complying with the appropriate standards prescribed by this paragraph.

(b) *Definitions.* For purposes of this section:

(1) "Shipbreaking" means any breaking down of a vessel's structure for the purpose of scrapping the vessel, including the removal of gear, equipment, or any component part of a vessel;

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, shipbreaking work, including, but not restricted to, inspection, survey, and employment as a watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as

a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

§ 1910.16 Longshoring.

(a) *Adoption and extension of established safety and health standards for longshoring.* The standards prescribed by Part 1504 of this title and in effect on April 28, 1971, are adopted as occupational safety or health standards under section 6(a) of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in longshoring operations or a related employment. Each employer shall protect the employment and places of employment of each of his employees engaged in a longshoring operation or a related employment, by complying with the appropriate standards prescribed by this paragraph.

(b) *Definitions.* For purposes of this section:

(1) "Longshoring operation" means the loading, unloading, moving, or handling of, cargo, ship's stores, gear, etc., into, in, on, or out of any vessel;

(2) "Related employment" means any employment performed as an incident to or in conjunction with, longshoring operations including, but not restricted to, securing cargo, rigging, and employment as a porter, checker, or watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

§ 1910.17 Effective dates.

(a) Except as provided in paragraphs (b) and (c) of this section, the standards prescribed in this Subpart B shall be effective on August 27, 1971.

(b) (1) To the extent that the standards prescribed in § 1910.12 apply to light residential construction or to other construction work, as defined in § 1910.12(b), which is not subject to the construction safety standards published in Part 1926 of this title, their application is delayed until September 27, 1971.

(2) For the purpose of subparagraph (1) of this paragraph, "light residential construction" is limited to the construction of homes and apartments which do not exceed three stories in height, and which have no elevator.

(c) Except as provided in paragraph (b) of this section, whenever any employment or place of employment is, or becomes, subject to any safety and health standard prescribed in Part 1915, 1916, 1917, 1918, or 1926 of this title on a date before August 27, 1971, by virtue of the Construction Safety Act or the Longshoremen's and Harbor Workers' Compensation Act, that occupational safety and health standard as incorporated by reference in this subpart shall also become effective under the Williams-Steiger Occupational Safety and Health Act of 1970 on that date.

§ 1910.18 Changes in established Federal standards.

Whenever an occupational safety and health standard adopted and incorporated by reference in this Subpart B is changed pursuant to section 6(b) of the Act and the statute under which the standard was originally promulgated, and in accordance with Part 1911 of this chapter, the standard shall be deemed changed for purposes of that statute and this Subpart B, and shall apply under this Subpart B. For the purposes of this section, a change in a standard includes any amendment, addition, or repeal, in whole or in part, of any standard.

§ 1910.19 Asbestos dust.

Section 1910.93a shall apply to the exposure of every employee to asbestos dust in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to asbestos dust which would otherwise be applicable by virtue of any of those sections.

Subpart C—[Reserved]

Subpart D—Walking-Working Surfaces

§ 1910.21 Definitions.

(a) As used in § 1910.23, unless the context requires otherwise, floor and wall opening, railing and toe board terms shall have the meanings ascribed in this paragraph.

(1) *Floor hole.* An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement, or yard, through which materials but not persons may fall; such as a belt hole, pipe opening, or slot opening.

(2) *Floor opening.* An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole. Floor openings occupied by elevators, dumb waiters, conveyors, machinery, or containers are excluded from this subpart.

(3) *Handrail.* A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish persons with a handhold in case of tripping.

(4) *Platform.* A working space for persons, elevated above the surrounding floor or ground; such as a balcony or platform for the operation of machinery and equipment.

(5) *Runway.* A passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

(6) *Standard railing.* A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

(7) *Standard strength and construction.* Any construction of railings, covers, or other guards that meets the requirements of § 1910.23.

(8) *Stair railing.* A vertical barrier erected along exposed sides of a stairway to prevent falls of persons.

(9) *Toeboard.* A vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials.

(10) *Wall hole.* An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

(11) *Wall opening.* An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall; such as a yard-arm doorway or chute opening.

(b) As used in § 1910.24, unless the context requires otherwise, fixed industrial stair terms shall have the meaning ascribed in this paragraph.

(1) *Handrail.* A single bar or pipe supported on brackets from a wall or partition to provide a continuous handhold for persons using a stair.

(2) *Nose, nosing.* That portion of a tread projecting beyond the face of the riser immediately below.

(3) *Open riser.* The air space between the treads of stairways without upright members (risers).

(4) *Platform.* An extended step or landing breaking a continuous run of stairs.

(5) *Railing.* A vertical barrier erected along exposed sides of stairways and platforms to prevent falls of persons. The top member of railing usually serves as a handrail.

(6) *Rise.* The vertical distance from the top of a tread to the top of the next higher tread.

(7) *Riser.* The upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread.

(8) *Stairs, stairway.* A series of steps leading from one level or floor to another, or leading to platforms, pits, boiler rooms, crossovers, or around machinery, tanks, and other equipment that are used more or less continuously or routinely by employees, or only occasionally by specific individuals. A series of steps and landings having three or more risers constitutes stairs or stairway.

(9) *Tread.* The horizontal member of a step.

(10) *Tread run.* The horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread.

(11) *Tread width.* The horizontal distance from front to back of tread including nosing when used.

(c) As used in § 1910.25, unless the context requires otherwise, portable wood ladders terms shall have the meanings ascribed in this paragraph.

(1) *Ladders.* A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) *Stepladder.* A stepladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) *Single ladder.* A single ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) *Extension ladder.* An extension ladder is a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) *Sectional ladder.* A sectional ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of two or more sections of ladder so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(6) *Trestle ladder.* A trestle ladder is a self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(7) *Extension trestle ladder.* An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(8) *Special-purpose ladder.* A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

(9) *Trolley ladder.* A trolley ladder is a semifixed ladder, nonadjustable in length, supported by attachments to an overhead track, the plane of the ladder being at right angles to the plane of motion.

(10) *Side-rolling ladder.* A side-rolling ladder is a semifixed ladder, nonadjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving, the plane of the ladder being also its plane of motion.

(11) *Wood characteristics.* Wood characteristics are distinguishing features which by their extent and number determine the quality of a piece of wood.

(12) *Wood irregularities.* Wood irregularities are natural characteristics in or on wood that may lower its durability, strength, or utility.

(13) *Cross grain.* Cross grain (slope of grain) is a deviation of the fiber direction from a line parallel to the sides of the piece.

(14) *Knot.* A knot is a branch or limb, imbedded in the tree and cut through in the process of lumber manufacture, classified according to size, quality, and occurrence. The size of the knot is determined as the average diameter on the surface of the piece.

(15) *Pitch and bark pockets.* A pitch pocket is an opening extending parallel to the annual growth rings containing, or that has contained, pitch, either solid or liquid. A bark pocket is an opening between annual growth rings that contains bark.

(16) *Shake.* A shake is a separation along the grain, most of which occurs between the rings of annual growth.

(17) *Check.* A check is a lengthwise separation of the wood, most of which occurs across the rings of annual growth.

(18) *Wane.* Wane is bark, or the lack of wood from any cause, on the corner of a piece.

(19) *Decay.* Decay is disintegration of wood substance due to action of wood-destroying fungi. It is also known as dote and rot.

(20) *Compression failure.* A compression failure is a deformation (buckling) of the fibers due to excessive compression along the grain.

(21) *Compression wood.* Compression wood is an aberrant (abnormal) and highly variable type of wood structure occurring in softwood species. The wood commonly has density somewhat higher than does normal wood, but somewhat lower stiffness and tensile strength for its weight in addition to high longitudinal shrinkage.

(22) *Low density.* Low-density wood is that which is exceptionally light in weight and usually deficient in strength properties for the species.

(d) As used in § 1910.26, unless the context requires otherwise, portable metal ladder terms shall have the meanings ascribed in this paragraph.

(1) *Ladder.* A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) *Step ladder.* A step ladder is a self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder measured along the front edge of the side rails.

(3) *Single ladder.* A single ladder is a non-self-supporting portable ladder, nonadjustable in length, consisting of but one section. Its size is designated by the overall length of the side rail.

(4) *Extension ladder.* An extension ladder is a non-self-supporting portable ladder adjustable in length. It consists of two or more sections traveling in guides or brackets so arranged as to permit length adjustment. Its size is designated by the sum of the lengths of the sections measured along the side rails.

(5) *Platform ladder.* A self-supporting ladder of fixed size with a platform provided at the working level. The size is determined by the distance along the front rail from the platform to the base of the ladder.

(6) *Sectional ladder.* A sectional ladder is a non-self-supporting portable ladder, non-adjustable in length, consisting of two or more sections so constructed that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections.

(7) *Trestle ladder.* A trestle ladder is a self-supporting portable ladder, nonadjustable in length, consisting of two sections, hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge.

(8) *Extension trestle ladder.* An extension trestle ladder is a self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together. The size is designated by the length of the trestle ladder base.

(9) *Special-purpose ladder.* A special-purpose ladder is a portable ladder which represents either a modification or a combination of design or construction features in one of the general-purpose types of ladders previously defined, in order to adapt the ladder to special or specific uses.

(e) As used in § 1910.27, unless the context requires otherwise, fixed ladder terms shall have the meanings ascribed in this paragraph.

(1) *Ladder.* A ladder is an appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person may step in ascending or descending.

(2) *Fixed ladder.* A fixed ladder is a ladder permanently attached to a structure, building, or equipment.

(3) *Individual-rung ladder.* An individual-rung ladder is a fixed ladder each rung of which is individually attached to a structure, building, or equipment.

(4) *Rail ladder.* A rail ladder is a fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.

(5) *Railings.* A railing is any one or a combination of those railings constructed in accordance with § 1910.23. A standard railing is a vertical barrier erected along exposed edges of floor openings, wall openings, ramps, platforms, and runways to prevent falls of persons.

(6) *Pitch.* Pitch is the included angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side.

(7) *Fastenings.* A fastening is a device to attach a ladder to a structure, building, or equipment.

(8) *Rungs.* Rungs are ladder crosspieces of circular or oval cross-section on which a person may step in ascending or descending.

(9) *Cleats.* Cleats are ladder crosspieces of rectangular cross-section placed on edge on which a person may step in ascending or descending.

(10) *Steps.* Steps are the flat crosspieces of a ladder on which a person may step in ascending or descending.

(11) *Cage.* A cage is a guard that may be referred to as a cage or basket guard which is an enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing

space of the ladder for the safety of the person who must climb the ladder.

(12) *Well*. A well is a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well. Proper clearances for a well will give the person who must climb the ladder the same protection as a cage.

(13) *Ladder safety device*. A ladder safety device is any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments.

(14) *Grab bars*. Grab bars are individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder.

(15) *Through ladder*. A through ladder is one from which a man getting off at the top must step through the ladder in order to reach the landing.

(16) *Side-step ladder*. A side-step ladder is one from which a man getting off at the top must step sideways from the ladder in order to reach the landing.

(f) As used in § 1910.28, unless the context requires otherwise, scaffolding terms shall have the meaning ascribed in this paragraph.

(1) *Bearer*. A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) *Boatswain's chair*. A seat supported by slings attached to a suspended rope, designed to accommodate one workman in a sitting position.

(3) *Brace*. A tie that holds one scaffold member in a fixed position with respect to another member.

(4) *Bricklayers' square scaffold*. A scaffold composed of framed wood squares which support a platform limited to light and medium duty.

(5) *Carpenters' bracket scaffold*. A scaffold consisting of wood or metal brackets supporting a platform.

(6) *Coupler*. A device for locking together the component parts of a tubular metal scaffold. The material used for the couplers shall be of a structural type, such as a drop-forged steel, malleable iron, or structural grade aluminum. The use of gray cast iron is prohibited.

(7) *Crawling board or chicken ladder*. A plank with cleats spaced and secured at equal intervals, for use by a worker on roofs, not designed to carry any material.

(8) *Double pole or independent pole scaffold*. A scaffold supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers, and diagonal bracing.

(9) *Float or ship scaffold*. A scaffold hung from overhead supports by means of ropes and consisting of a substantial platform having diagonal bracing underneath, resting upon and securely fastened to two parallel plank bearers at right angles to the span.

(10) *Guardrail*. A rail secured to uprights and erected along the exposed sides and ends of platforms.

(11) *Heavy duty scaffold*. A scaffold designed and constructed to carry a working load not to exceed 75 pounds per square foot.

(12) *Horse scaffold*. A scaffold for light or medium duty, composed of horses supporting a work platform.

(13) *Interior hung scaffold*. A scaffold suspended from the ceiling or roof structure.

(14) *Ladder jack scaffold*. A light duty scaffold supported by brackets attached to ladders.

(15) *Ledger (stringer)*. A horizontal scaffold member which extends from post to post and which supports the putlogs or bearer forming a tie between the posts.

(16) *Light duty scaffold*. A scaffold designed and constructed to carry a working load not to exceed 25 pounds per square foot.

(17) *Manually propelled mobile scaffold*. A portable rolling scaffold supported by casters.

(18) *Masons' adjustable multiple-point suspension scaffold*. A scaffold having a continuous platform supported by bearers suspended by wire rope from overhead supports, so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(19) *Maximum intended load*. The total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

(20) *Medium duty scaffold*. A scaffold designed and constructed to carry a working load not to exceed 50 pounds per square foot.

(21) *Mid-rail*. A rail approximately midway between the guardrail and platform, used when required, and secured to the uprights erected along the exposed sides and ends of platforms.

(22) *Needle beam scaffold*. A light duty scaffold consisting of needle beams supporting a platform.

(23) *Outrigger scaffold*. A scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such a building or structure.

(24) *Putlog*. A scaffold member upon which the platform rests.

(25) *Roofing bracket*. A bracket used in sloped roof construction, having provisions for fastening to the roof or supported by ropes fastened over the ridge and secured to some suitable object.

(26) *Runner*. The lengthwise horizontal bracing or bearing members or both.

(27) *Scaffold*. Any temporary elevated platform and its supporting structure used for supporting workmen or materials or both.

(28) *Single-point adjustable suspension scaffold*. A manually or power-operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

(29) *Single pole scaffold*. Platforms resting on putlogs or crossbeams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights and the inner ends of which are supported on or in a wall.

(30) *Stone setters' adjustable multiple-point suspension scaffold*. A swinging-type scaffold having a platform supported by hangers suspended at four points so as to permit the raising or lowering of the platform to the desired working position by the use of hoisting machines.

(31) *Toe board*. A barrier secured along the sides and ends of a platform, to guard against the falling of material.

(32) *Tube and coupler scaffold*. An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and special couplers which serve to connect the uprights and to join the various members.

(33) *Tubular welded frame scaffold*. A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members. Panels or frames shall be braced with diagonal or cross braces.

(34) *Two-point suspension scaffold (swinging scaffold)*. A scaffold, the platform of which is supported by hangers (stirrups) at two points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

(35) *Window jack scaffold*. A scaffold, the platform of which is supported by a bracket or jack which projects through a window opening.

(36) *Working load*. Load imposed by men, materials, and equipment.

(g) As used in § 1910.29, unless the context requires otherwise, manually propelled mobile ladder stand and scaffold (tower) terms shall have the meaning ascribed in this paragraph.

(1) *Bearer*. A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

(2) *Brace*. A tie that holds one scaffold member in a fixed position with respect to another member.

(3) *Climbing ladder*. A separate ladder with equally spaced rungs usually attached to the scaffold structure for climbing and descending.

(4) *Coupler*. A device for locking together the components of a tubular metal scaffold which shall be designed and used to safely support the maximum intended loads.

(5) *Design working load*. The maximum intended load, being the total of all loads including the weight of the men, materials, equipment, and platform.

(6) *Equivalent*. Alternative design or features, which will provide an equal degree or factor of safety.

(7) *Guardrail*. A barrier secured to uprights and erected along the exposed sides and ends of platforms to prevent falls of persons.

(8) *Handrail.* A rail connected to a ladder stand running parallel to the slope and/or top step.

(9) *Ladder stand.* A mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

(10) *Ledger (stringer).* A horizontal scaffold member which extends from post to post and which supports the bearer forming a tie between the posts.

(11) *Mobile scaffold (tower).* A light, medium, or heavy duty scaffold mounted on casters or wheels.

(12) *Mobile.* "Manually propelled."

(13) *Mobile work platform.* Generally a fixed work level one frame high on casters or wheels, with bracing diagonally from platform to vertical frame.

(14) *Runner.* The lengthwise horizontal bracing and/or bearing members.

(15) *Scaffold.* Any temporary elevated platform and its necessary vertical, diagonal, and horizontal members used for supporting workmen and materials. (Also known as a scaffold tower.)

(16) *Toe board.* A barrier at platform level erected along the exposed sides and ends of a scaffold platform to prevent falls of materials.

(17) *Tube and coupler scaffold.* An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and uprights, and serves to join the various members, usually used in fixed locations.

(18) *Tubular welded frame scaffold.* A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections, which consist of posts and bearers with intermediate connecting members and braced with diagonal or cross braces.

(19) *Tubular welded sectional folding scaffold.* A sectional, folding metal scaffold either of ladder frame or inside stairway design, substantially built of prefabricated welded sections, which consist of end frames, platform frame, inside inclined stairway frame and braces, or hinged connected diagonal and horizontal braces, capable of being folded into a flat package when the scaffold is not in use.

(20) *Work level.* The elevated platform, used for supporting workmen and their materials, comprising the necessary vertical, horizontal, and diagonal braces, guardrails, and ladder for access to the work platform.

§ 1910.22 General requirements.

This section applies to all permanent places of employment, except where domestic, mining, or agricultural work only is performed. Measures for the control of toxic materials are considered to be outside the scope of this section.

(a) *Housekeeping.* (1) All places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition.

(2) The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained, and false floors, platforms, mats, or other dry standing places should be provided where practicable.

(3) To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

(b) *Aisles and passageways.* (1) Where mechanical handling equipment is used, sufficient safe clearances shall be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways shall be kept clear and in good repairs, with no obstruction across or in aisles that could create a hazard.

(2) Permanent aisles and passageways shall be appropriately marked.

(c) *Covers and guardrails.* Covers and/or guardrails shall be provided to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.

(d) *Floor loading protection.* (1) In every building or other structure, or part thereof, used for mercantile, business, industrial, or storage purposes, the loads approved by the building official shall be marked on plates of approved design which shall be supplied and securely affixed by the owner of the building, or his duly authorized agent, in a conspicuous place in each space to which they relate. Such plates shall not be removed or defaced but, if lost, removed, or defaced, shall be replaced by the owner or his agent.

(2) It shall be unlawful to place, or cause, or permit to be placed, on any floor or roof of a building or other structure a load greater than that for which such floor or roof is approved by the building official.

§ 1910.23 Guarding floor and wall openings and holes.

(a) *Protection for floor openings.* (1) Every stairway floor opening shall be guarded by a standard railing constructed in accordance with paragraph (e) of this section. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).

(2) Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.

(3) Every hatchway and chute floor opening shall be guarded by one of the following:

(i) Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto so as to leave only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.

(ii) A removable railing with toeboard on not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use and should preferably be hinged or otherwise mounted so as to be conveniently replaceable.

Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.

(4) Every skylight floor opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.

(5) Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction which should be hinged in place. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.

(6) Every manhole floor opening shall be guarded by a standard manhole cover which need not be hinged in place. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.

(7) Every temporary floor opening shall have standard railings, or shall be constantly attended by someone.

(8) Every floor hole into which persons can accidentally walk shall be guarded by either:

(i) A standard railing with standard toeboard on all exposed sides, or

(ii) A floor hole cover of standard strength and construction that should be hinged in place. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.

(9) Every floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than 1 inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.

(10) Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

(b) *Protection for wall openings and holes.* (1) Every wall opening from which there is a drop of more than 4 feet shall be guarded by one of the following:

(i) Rail, roller, picket fence, half door, or equivalent barrier.

The guard may be removable but should preferably be hinged or otherwise mounted so as to be conveniently replaceable. Where there is exposure below to falling materials, a removable toe board or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4 feet above floor level and of standard strength and mounting.

(ii) Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.

(2) Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by one or more of the barriers specified in subparagraph (1) of this paragraph, or as required by the conditions.

(3) Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4 feet, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work (as specified in paragraph (e)(11) of this section), or standard railing.

Where the window opening is below the landing, or platform, a standard toe board shall be provided.

(4) Every temporary wall opening shall have adequate guards but these need not be of standard construction.

(5) Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5 feet above the next lower level, the hole shall be protected by a standard toeboard, or an enclosing screen either of solid construction, or as specified in paragraph (e)(11) of this section.

(c) *Protection of open-sided floors, platforms, and runways.* (1) Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing (or the equivalent as specified in paragraph (e)(3) of this section) on all open sides, except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides,

(i) Persons can pass,

(ii) There is moving machinery, or

(iii) There is equipment with which falling materials could create a hazard.

(2) Every runway shall be guarded by a standard railing (or the equivalent as specified in paragraph (e)(3) of this section) on all open sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.

Runways used exclusively for special purposes (such as oiling, shafting, or filling tank cars) may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become thereby exposed to machinery, electrical equipment, or other danger not a falling hazard, additional guarding than is here specified may be essential for protection.

(3) Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, and similar hazards shall be guarded with a standard railing and toe board.

(d) *Stairway railings and guards.* (1) Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails as specified in subdivisions (i) through (v) of this subparagraph, the width of the stair to be measured clear of all obstructions except handrails:

(i) On stairways less than 44 inches wide having both sides enclosed, at least one handrail, preferably on the right side descending.

(ii) On stairways less than 44 inches wide having one side open, at least one stair railing on open side.

(iii) On stairways less than 44 inches wide having both sides open, one stair railing on each side.

(iv) On stairways more than 44 inches wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.

(v) On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.

(2) Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

(e) *Railing, toe boards, and cover specifications.* (1) A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

(2) A stair railing shall be of construction similar to a standard railing but the vertical height shall be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

(3) Minimum requirements for standard railings under various types of construction are specified in the following subdivisions. Dimensions specified are based on the U.S. Department of Agriculture Wood Handbook, No. 72, 1955 (No. 1 [S4S] Southern Yellow Pine [Modulus of Rupture 7,400 p.s.i.]) for wood; ANSI G41.5-1970, American National Standard Specifications for Structural Steel, for structural steel; and ANSI B125.1-1970, American National Standard Specifications for Welded and Steamless Steel Pipe, for pipe.

(i) For wood railings, the posts shall be of at least 2-inch by 4-inch stock spaced not to exceed 6 feet; the top and intermediate rails shall be of at least 2-inch by 4-inch stock. If top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.

(ii) For pipe railings, posts and top and intermediate railings shall be at least 1½ inches nominal diameter with posts spaced not more than 8 feet on centers.

(iii) For structural steel railings, posts and top and intermediate rails shall be of 2-inch by 2-inch by ⅜-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.

(iv) The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.

(v) Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions:

(*a*) A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal;

(*b*) A strength to withstand at least the minimum requirement of 200 pounds top rail pressure;

(*c*) Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;

(*d*) Elimination of overhang of rail ends unless such overhang does not constitute a hazard; such as, baluster railings, scrollwork railings, paneled railings.

(4) A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than ¼-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.

Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail shall be provided.

(5)(i) A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail so as to offer no obstruction to a smooth surface along the top and both sides of the handrail. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The ends of the handrail should be turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.

(ii) The height of handrails shall be not more than 34 inches nor less than 30 inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.

(iii) The size of handrails shall be: When of hardwood, at least 2 inches in diameter; when of metal pipe, at least

1½ inches in diameter. The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereon of at least 3 inches. The spacing of brackets shall not exceed 8 feet.

(iv) The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point on the rail.

(6) All handrails and railings shall be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.

(7) Floor opening covers may be of any material that meets the following strength requirements:

(i) Trench or conduit covers and their supports, when located in plant roadways, shall be designed to carry a truck rear-axle load of at least 20,000 pounds.

(ii) Manhole covers and their supports, when located in plant roadways, shall comply with local standard highway requirements if any; otherwise, they shall be designed to carry a truck rear-axle load of at least 20,000 pounds.

(iii) The construction of floor opening covers may be of any material that meets the strength requirements. Covers projecting not more than 1 inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30 degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.

(8) Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of slatwork with openings not more than 2 inches wide with length unrestricted.

(9) Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward) at any point on the top rail or corresponding member.

(10) Wall opening grab handles shall be not less than 12 inches in length and shall be so mounted as to give 3 inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.

(11) Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than 8 inches long, or of slatwork with openings not more than 4 inches wide with length unrestricted.

§ 1910.24 Fixed industrial stairs.

(a) *Application of requirements.* This section contains specifications for the safe design and construction of fixed general industrial stairs. This classification includes interior and exterior stairs around machinery, tanks, and other equipment, and stairs leading to or from floors, platforms, or pits. This section does not apply to stairs used for fire exit purposes, to construction operations to private residences, or to articulated stairs, such as may be installed on floating roof tanks or on dock facilities, the angle of which changes with the rise and fall of the base support.

(b) *Where fixed stairs are required.* Fixed stairs shall be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment which requires attention routinely during operations. Fixed stairs shall also be provided where access to elevations is daily or at each shift for such purposes as gauging, inspection, regular maintenance, etc., where such work may expose employees to acids, caustics, gases, or other harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required. (It is not the intent of this section to preclude the use of fixed ladders for access to elevated tanks, towers, and similar structures, overhead traveling cranes, etc., where the use of fixed ladders is common practice.) Spiral stairways shall not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway. Winding stairways may be installed on tanks and similar round structures where the diameter of the structure is not less than five (5) feet.

(c) *Stair strength.* Fixed stairways shall be designed and constructed to carry a load of five times the normal live load anticipated but never of less strength than to carry safely a moving concentrated load of 1,000 pounds.

(d) *Stair width.* Fixed stairways shall have a minimum width of 22 inches.

(e) *Angle of stairway rise.* Fixed stairs shall be installed at angles to the horizontal of between 30° and 50°. Any uniform combination of rise/tread dimensions may be used that will result in a stairway at an angle to the horizontal within the permissible range. Table D–1 gives rise/tread dimensions which will produce a stairway within the permissible range, stating the angle to the horizontal produced by each combination. However, the rise/tread combinations are not limited to those given in Table D–1.

(f) *Stair treads.* Each tread and the top landing of a stairway, where risers are used, should have a nose which extends one-half inch to 1 inch beyond the face of the lower riser. Noses should have an even leading edge. All treads shall be reasonably slip-resistant and the nosings shall be of nonslip finish. Welded bar grating treads without nosings are acceptable providing the leading edge can be readily identified by personnel descending the stairway and provided the tread is serrated or is of definite nonslip design. Rise height and tread width shall be uniform throughout any flight of stairs including any foundation structure used as one or more treads of the stairs.

TABLE D–1

Angle to horizontal	Rise (in inches)	Tread run (in inches)
30°35′	6½	11
32°08′	6¾	10¾
33°41′	7	10½
35°16′	7¼	10¼
36°52′	7½	10
38°29′	7¾	9¾
40°08′	8	9½
41°44′	8¼	9¼
43°22′	8½	9
45°00′	8¾	8¾
46°38′	9	8½
48°16′	9¼	8¼
49°54′	9½	8

(g) *Length of stairways.* Long flights of stairs, unbroken by landings or intermediate platforms, should be avoided. Consideration should be given to providing intermediate platforms where practical and where such stairways are in frequent use. Stairway platforms shall be no less than the width of a stairway and a minimum of 30 inches in length measured in the direction of travel.

(h) *Railings and handrails.* Standard railings shall be provided on the open sides of all exposed stairways and stair platforms. Handrails shall be provided on at least one side of closed stairways, preferably on the right side descending. Stair railings and handrails shall be installed in accordance with the provisions of § 1910.23.

(i) *Vertical clearance.* Vertical clearance above any stair tread to an overhead obstruction shall be at least 7 feet measured from the leading edge of the tread.

(j) *Open risers.* Stairs having treads of less than 9-inch width should have open risers.

(k) *General.* Open grating type treads are desirable for outside stairs.

§ 1910.25 Portable wood ladders.

(a) *Application of requirements.* This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage. Other types of special ladders, fruitpicker's ladders, combination step and extension ladders, stockroom step ladders, aisle-way step ladders, shelf ladders, and library ladders are not specifically covered by this section.

(b) *Materials*—(1) *Requirements applicable to all wood parts.* (i) All wood parts shall be of the species specified in Table D–5, seasoned to a moisture content of not more than 15 percent; smoothly machined and dressed on all sides; free from sharp edges and splinters; sound and free by accepted visual inspection from shake, wane, compression failures, decay, or other irregularities except as hereinafter provided. Low-density wood shall not be used.

(ii) Black streaks in western hemlock shall not be considered an irregularity, except that chambers associated with black streaks, when present in the part, shall be limited as specified for pitch and bark pockets.

(2) *Permissible irregularities in side rails and back rails* (i) The general slope of grain in side rails of minimum dimension shall not be steeper than 1 in 12, except that for ladders under 10 feet in length and having flat steps for treads, the general slope of grain shall not be steeper than 1 in 10. The slope of grain in areas of local grain deviation shall not be steeper than 1 in 12 or 1 in 10 as specified above when occurring on the edges or in the outer one-fourth of the width of the wide face. Local areas of grain deviation within the center half of the width of the wide face may contain grain slope as steep as 1 in 8. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(ii) Knots shall not appear in narrow faces of side rails. Knots, if tight and sound and less than one-half inch in diameter, are permitted on the wide face provided they are at least one-half inch back from either edge and not more frequent than 1 to any 3 feet of ladder length.

(iii) Pitch and bark pockets are permitted provided they are not more than one-eighth inch in width, or more than 2 inches in length, or more than one-half inch in depth, and then only if they are not more frequent than 1 to any 3 feet of ladder length.

(iv) Checks are permitted on side rails provided they are not more than 6 inches in length or more than one-half inch in depth.

(v) Occurrences of compression wood in relatively small amounts and positively identified by competent and conscientious visual inspection of side rails are permitted provided no single streak shall exceed one-half inch in width nor shall the aggregate of streaks exceed one-fourth of the face of the side rail. Borderline forms of compression wood not positively identified by competent and conscientious visual inspection are permitted. Ladder parts containing bow or crook which would interfere with the operation of the ladder shall not be used.

(3) *Permissible irregularities in flat steps, rungs, and cleats.* (i) The general slope of grain in flat steps of minimum dimension shall not be steeper than 1 in 12, except that for ladders under 10 feet in length the slope of grain shall not be steeper than 1 in 10. The slope of grain in areas of local deviation shall not be steeper than 1 in 12 or 1 in 10 as specified above. For all ladders, cross grain not steeper than 1 in 10 are permitted in lieu of 1 in 12, provided the size is increased to afford at least 15 percent greater calculated strength than for ladders built to minimum dimensions. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(ii) The general slope of grain and that in areas of local deviations of grain shall not be steeper than 1 in 15 in rungs and cleats. For all ladders cross grain not steeper than 1 in 12 are permitted in lieu of 1 in 15, provided the size is increased to afford at least 15 percent greater calculated strength for ladders built to minimum dimensions. Local deviations of grain associated with otherwise permissible irregularities are permitted.

(iii) Knots over one-eighth inch in diameter shall not appear in rungs. Knots shall not appear in the narrow faces of flat steps and cleats. Knots appearing in the wide faces of flat steps and cleats shall not exceed a diameter of one-fourth inch.

(4) *Classification of species of wood.* Table D–5 gives a list of native woods, divided into four groups on the basis of mechanical properties considered from the standpoint of use for ladder construction.

(i) All minimum dimensions and specifications set forth hereinafter for side rails and flat steps are based on the species of wood listed in Group 3 in Table D–5 except where otherwise provided. The species of all other groups may be substituted for those of Group 3 when used in sizes that provide at least equivalent strength. (See Table D–5 for suggested methods of size adjustment.)

(ii) All minimum dimensions and specifications set forth hereinafter for rungs and cleats are based on the species of wood listed in Group 1 in Table D–5. Cleats may be made of species of any other group provided that the cross-sectional dimensions specified for Group 1 species are increased by the factors shown in this subdivision (based on the percentages of Table D–5) for the species group of which the cleats are to be made.

FACTOR FOR INCREASE IN

Species group	Each dimension	Width only (thickness unchanged)
1	1.00	1.00
2	1.03	1.05
3	1.11	1.19
4	1.17	1.26

(5) *Metal parts.* All metal parts shall be made of aluminum, steel, wrought iron, malleable iron, or other material, adequate in strength for the purpose intended.

(c) *Construction requirements*—(1) *Basis of requirements.* (i) Dimensions specified hereinafter for wood ladders are the minimum dressed cross-sectional dimensions for the types of ladders herein designated, based on the species of woods specified in paragraph (b) (4) of this section, at a moisture content of 15 percent. The dimensions for side rails are based on a mortise or gain as specified for the various types of ladders for step or rung attachments. Where the strength of the side rails or back legs is reduced by a greater mortise or gain than shown, or where it is desired to use a cross section for any wood part either dimension of which is less than that specified, the required dimensions may be found as indicated in subdivision (ii) of this subparagraph.

(ii) For the side rails of single extension and sectional ladders, the proposed section shall develop an actual stress per square inch not greater than 2,150 pounds for Group 1 woods, 2,000 pounds for Group 2 woods, 1,600 pounds for Group 3 woods, or 1,375 pounds for Group 4 woods when computed by the following formula applying to rectangular sections, with a maximum tolerance of 5 percent over these stresses:

$$S=\frac{3\,LD\,(P+W/16)}{2B\,(D^3-d^3)}=\frac{1.5\,LD\,(25+W/16)}{B\,(D^3-0.67)}$$

P=25 pounds, which is the normal component on each rail of a load of 200 pounds at the center of the ladder, equally distributed between the rails, when the foot of the ladder is moved out of the perpendicular by one-quarter of its length.

S=Stress in extreme fiber in pounds per square inch.

W=Weight of ladder in pounds.

L=Maximum working length of ladder in inches.

B=Net thickness of each side rail in inches.

D=Depth of side rail in inches.

d=Diameter of hole board for rung (d^3 shall be taken as not less than 0.67).

(iii) Adjustment of sizes for wood parts of stepladders and other ladder types covered by this section may be made as follows:

(*a*) The dimensions specified in later sections for parts having rectangular cross sections generally represent only one of a number of possible combinations of thickness and width which could satisfy the requirements for strength and stiffness. Depending upon the material sizes available, manufacturing practices, and like factors, parts produced by a particular manufacturer may or may not agree exactly with the sizes given later. The following provisions provide means for determining equality of load-carrying capacity of parts of different sizes or of determining sizes needed to provide equality.

(*b*) Any changes in dimensions shall result in a change in the width-thickness ratio for side rails of back legs not greater than 25 percent from the ratio for a corresponding ladder as now covered in this section.

(*c*) Where both dimensions are different from those specified, the load-carrying capacity in bending of a part will be equal to or greater than that of a part of specified dimensions if the ratio P_2/P_1 is not less than 1, where

$$\frac{P_2}{P_1}=\frac{B_2D_2^2}{B_1D_1^2}$$

and

B=Dimension of the part at right angles to the direction of load (width of a step, thickness of a side rail or back leg).

D=Dimension of the part parallel to the direction of load (thickness of a step, width of a side rail or back leg).

B_1D_1=Dimensions as specified.

B_2D_2=Dimensions of part being considered.

(*d*) The dimensions to be used in the computations are net dimensions. For example, in the case of a stepladder side rail, the dimension B is to be taken as the gross thickness of the rail minus the depth of the gain for the steps. Where there is a rung hole at the center of depth of a rail, a somewhat more accurate comparison may be made by the use of the formula

$$\frac{P_2}{P_1}=\frac{B_2D_1(D_2^3-d^3)}{B_1D_2(D_1^3-d^3)}$$

where the symbols have the same meanings as before and *d* is the diameter of the hole for the rung tenon. In most instances the difference in results calculated by this and by the earlier formula will be slight.

(2) *Portable stepladders*. Stepladders longer than 20 feet shall not be supplied. Stepladders as hereinafter specified shall be of three types:

Type I—Industrial stepladder, 3 to 20 feet for heavy duty, such as utilities, contractors, and industrial use.

Type II—Commercial stepladder, 3 to 12 feet for medium duty, such as painters, offices, and light industrial use.

Type III—Household stepladder, 3 to 6 feet for light duty, such as light household use.

(i) *General requirements*. (*a*) Slope is the inclination of side rails or back legs with respect to the vertical and is expressed as a deviation from the vertical per unit length of the member. Stepladders shall be so constructed, that when in the open position, the slope of the front section shall not be less than 3½ inches and the slope of the back section not less than 2 inches, for each 12-inch length of side rail.

(*b*) A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.

(*c*) The minimum width between side rails at the top, inside to inside, shall be not less than 11½ inches. From top to bottom, the side rails shall spread at least 1 inch for each foot of length of stepladder.

(*d*) When minimum thickness of side rails is used, steps shall be closely fitted into the grooves in the side rails one-eighth inch in depth with a tolerance of one thirty-second inch, and shall be firmly secured as hereinafter described; or they shall be closely fitted into metal brackets of an equivalent strength, which in turn shall be firmly secured to the side rails. The depth of groove herein provided may be increased in proportion to the thickness of side rails as provided in subdivisions (ii)(*a*), (iii)(*a*), and (iv)(*a*) of this subparagraph.

(*e*) All stepladders shall have a top with wood or metal brackets or fittings tightly secured to the top, side rails, and back legs, to allow free swinging of the back section without excessive play or wear at the joints.

(*f*) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all sharp points covered or removed to protect the user. For Type III ladder, the pail shelf and spreader may be combined in one unit (the so-called shelf-lock ladder).

(*g*) When measured along the front edge of the side rails, all stepladders shall measure within 3 inches of the specified length.

(*h*) Where bucket shelves are provided, they shall be constructed to support a load of 25 pounds and shall be so fastened that they can be folded up when the ladder is closed.

(*i*) All metal parts and fittings shall be securely attached by means of rivets, bolts, screws, or equivalent fasteners.

(ii) *Type I industrial stepladder*. (*a*) (*1*) The minimum dimensions of the parts of the Type I stepladder shall be as shown in Table D–2 when made of Group 2 or Group 3 woods.

(*2*) The minimum thickness of side rails provides for the cutting of a groove of one-eighth inch in depth with the tolerance indicated in subdivisions (i)(*d*) of this subparagraph, and shall be increased when grooves of greater depth are used.

(*b*) Steps shall be secured with at least two 6–d nails at each end, or the equivalent thereof. Each step shall be reinforced by a steel rod not less than 0.160 inch in diameter with standard commercial tolerances, which shall pass through metal washers of sufficient thickness and diameter on each end to prevent pressing—into the side rails, and a truss block which shall be fitted between the rod and the center of each step, or by a metal angle brace on each end firmly secured to the steps and side rails, or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rails. In addition, all steps 3⅝ inches wide and 27 inches or more in overall length and all steps 4¼ inches wide and 32 inches or more in overall length shall be provided with a metal angle brace at each end securely attached to the step and side rail.

(*c*) The back section shall be braced by one of the following methods:

(*1*) The back legs shall be braced with 1⅛-inch diameter rungs of Group 1 woods (see Table D–5), or material of equivalent strength, having ⅞-inch diameter tenons or oval wood rungs, or rectangular wood rungs of equivalent strength, spaced not more than 12 inches apart. The back legs shall be bored with holes either extending through the legs or to within three-sixteenths inch of the outside face of the legs, the size of the hole to be such as to insure a tight fit for the rung. The shoulder of the rung shall be forced firmly against the leg, and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning of the rungs. The back legs shall be braced by a metal angle brace on each side, securely fastened to the rung and the back legs, one rung to be braced for each 4 feet of length or fraction thereof, on ladders 4 feet or more in length, with braces required only on the bottom rung for ladders that are 4 feet or shorter. Where rungs are more than 28 inches in length between the back legs they shall be provided with center bearing consisting of a wood bar not less than ¾ by 2 inches in cross-section securely nailed to each rung passing through it and long enough to include each rung longer than 28 inches.

(*2*) The back leg shall be braced with horizontal wood bars of Group 1, 2, or 3 woods in Table D–5 and not less than ¾ by 2½ inches in cross-section, spaced not more than 12 inches apart. The ends of the bars shall fit into metal sockets of not less than 20-gauge (Manufacturers Standard) steel, or other material of equivalent strength, or into mortises of not less than one-eighth inch (tolerance of ±one-thirty-second inch) in depth in the back legs. A steel rod not less than 0.160 inch in diameter with standard commercial tolerance shall pass through the back legs, the bar, and at each end through metal washers of sufficient diameter and thickness to prevent passing into the back legs. The back legs shall also be braced by a metal angle brace on each side, securely fastened to the bar and to the legs, one bar to be so braced for at least each 4 feet of length or fraction thereof, with braces required only on bottom bar for ladders that are 4 feet or shorter. Metal sockets when used shall be attached to the back legs by rivets or by means of a rod running through the socket or equivalent thereof.

TABLE D-2

DIMENSIONS FOR TYPE I STEP LADDER

	Length, 12 feet and less		Length, 14 and 16 feet		Length, 18 and 20 feet	
	Thickness (*inch*)	*Depth* (*inches*)	*Thickness* (*inch*)	*Depth* (*inches*)	*Thickness* (*inch*)	*Depth* (*inches*)
Side rails	¾	3¼	¾	3½	1¹⁄₁₆	3½
Back legs	¾	2¼	¾	2⅝	1¹⁄₁₆	2¼
Steps	¾	3⅝	¾	4¼	¾	4¼
Tops	¾	5½	¾	5½	¾	5½

TABLE D-3

DIMENSIONS FOR TYPE II STEP LADDER

	Length, 3 to 8 feet		Length, 10 feet		Length, 12 feet	
	Thickness (*inch*)	*Depth* (*inches*)	*Thickness* (*inch*)	*Depth* (*inches*)	*Thickness* (*inch*)	*Depth* (*inches*)
Side rails	¾	2⅝	¾	2⅝	¾	3
Back legs	¾	1⅝	¾	1¾	¾	2
Steps	¾	3½	¾	3½	¾	3⅝
Tops	¾	5	¾	5	¾	5

* * * * * * *

(*d*) The back legs shall be reinforced by a rivet through the depth of the leg above the hinge point, by metal plates or collars at the hinge point, or by other means suitable for preventing splitting of the back leg from the hinge pin to the top.

(iii) *Type II commercial stepladder.* (*a*) (*1*) The minimum dimensions of the parts of the Type II stepladder shall be as given in Table D–3 when made of Group 2 or Group 3 woods.

(*2*) The minimum thickness of side rails provides for the cutting of a groove of one-eighth inch in depth with the tolerance indicated in subdivision (i) (*d*) of this subparagraph, and shall be increased when grooves of greater depth are used.

(*b*) Steps shall be secured with at least two 6-d nails at each end, or the equivalent thereof. Each step shall be reinforced by by a steel rod not less than 0.160 inch in diameter with standard commercial tolerances which shall pass through metal washers of sufficient thickness and diameter on each end to prevent pressing into the side rails, and a truss block shall be fitted between the truss rod and center of each step; or by a metal angle brace on each end firmly secured to the steps and side rails; or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rails. In addition all steps 27 inches or more in overall length shall be provided with a metal angle brace at each end securely attached to the step and side rails.

(*c*) The back legs shall be braced by one of the three following methods:

(*1*) (*i*) With ⅞-inch diameter wood dowels of Group 1 woods (see Table D–5) or material of equivalent strength having not less than ⅝-inch tenons firmly secured in the back legs and spaced not more than 12 inches apart. The back legs shall be bored with holes either extending through the legs or to within three-sixteenths inch of the outside face of the legs, the size of the hole to be such as to insure a tight fit for the dowel. The shoulder of the dowel shall be forced firmly against the leg and the tenon secured in place with a nail, or the equivalent thereof, to prevent turning of the dowel.

(*ii*) A bar connecting two or more of the dowels shall be provided on all ladders of 6 feet or more. The cross-sectional dimensions of the bar shall be the same as the cross-sectional dimensions of the back legs, and the dowels shall pass through holes at the centerline of the bar. The bar shall be attached at the center of the length of the lower two dowels on a 6-foot ladder and shall extend upward one dowel for each 2 feet of added length.

(*2*) With wood dowels as set forth in this subdivision (iii) (*c*) (*1*), plus an inverted V bracing of ¾- by 1½-inch material through which the dowels extend, the length of the V to extend two-thirds of the way up the back.

(*3*) With horizontal bracing of Group 1, 2, 3, or 4 woods (see Table D–5) not less than ¾ by 2 inches in cross-section, the ends of which shall fit into metal sockets of not less than 20-gauge (Manufacturing Standard), steel, or other material of equivalent strength or into mortises not less than one-eighth inch in depth in back legs. The bars shall be reinforced by steel rods not less than 0.160 inch in diameter with standard commercial tolerances which shall pass through the back legs, the bar, and, at each end, through metal washers of sufficient diameter and thickness to prevent pressing into the back legs. The spacing of such braces shall not exceed 3 feet, and there shall be one brace on 3- and 4-foot ladders, two braces on 5- and 6-foot ladders, three braces on 7- and 8-foot ladders, and four braces on 10- and 12-foot ladders. The bottom bar shall not be more than 18 inches from the bottom of the ladder, and, where only one bar is used, it shall be braced by a metal angle brace on each end securely attached to the bar and the back leg.

(iv) *Type III household stepladder.* (*a*) The minimum dimensions of the parts of the Type III stepladder shall be as follows when made of Group 2 or Group 3 woods:

	Length, 3 to 6 feet	
	Thickness (inch)	Depth (inches)
Side rails	¾	2½
Back legs	¾	1 5/16
Steps	¾	3
Top	¾	5

The minimum thicknesses of side rails provide for the cutting of a groove one-eighth inch in depth with the tolerance indicated in subdivision (i) (*d*) of this subparagraph, and shall be increased when grooves of greater depth are used.

(*b*) Steps shall be secured with at least one 6-d nail at each end, or the equivalent thereof. Each step shall be reinforced by a steel rod not less than 0.160 inch in diameter with standard commercial tolerance which shall pass through metal washers of sufficient thickness and diameter to prevent pressing into the side rails, or by a metal brace at each end firmly secured to steps and side rails or by construction of equivalent strength and safety. Where the rod reinforcement construction is used, the bottom step shall be provided further with a metal angle brace on each end which shall be securely attached to the bottom step and side rail.

(*c*) Back legs shall be braced by one of the two following methods or by construction of equivalent strength and safety:

(*1*) By diagonal slates of groups 1, 2, 3, or 4 wood (see Table D–5) not less than 5/16 by 1¼ inches securely fastened to the back legs by nails, screws, or the equivalent thereof.

(*2*) With horizontal bracing of Groups 1, 2, 3, or 4 wood (see Table D–5) not less than ⅝ by 1⅝ inches in cross section, the ends of which shall fit into metal sockets of not less than 20-gauge (Manufacturing Standard) steel or other material of equivalent strength or into mortises not less than one-eighth inch in depth in back legs. The bars shall be reinforced by steel rods not less than 0.160 inch in diameter with standard commercial tolerances which shall pass through the back leg, the bar, and at each end through metal washers of sufficient diameter and thickness to prevent pressing into each leg. The spacing of such bars shall not exceed 3 feet, and there shall be one brace on 3- and 4-foot ladders, two braces on 5- and 6-foot ladders. The bottom bar shall be not more than 18 inches from the bottom of the ladder.

(3) *Portable rung ladders.* Portable rung ladders as herein specified shall be of four types, as follows: single ladder; two-section extension ladder; sectional ladder; trestle and extension trestle ladder.

(i) *General requirements.* (*a*) The base or lower portion of a ladder may have either parallel sides or flared sides in accordance with commercial practice.

(*b*) Rungs shall be parallel, level, and uniformly spaced. The spacing shall be not more than 12 inches, except as hereinafter specified.

(*c*) All holes for wood rungs shall either extend through the side rails or be bored so as to give at least a thirteen-sixteenths-inch length of bearing to the rung tenon. In through-bored construction, the rungs shall extend at least flush with the outside rail surface. All holes shall be located on the center line of the wide face of the side rails and shall be of such size as to insure a tight fit for the rung. The shoulder of the rung shall be forced firmly against the side rails and the tenon secured in place with a nail or the equivalent thereof, for the sole purpose of preventing the turning of the rung and maintaining the rung position in the side rail.

(*d*) Round rungs shall be of Group 1 woods (see Table D–5), shall be not less than 1⅛ inches in diameter for lengths up to 36 inches between side rails and 1¼ inches in diameter for lengths over 36 up to and including 72 inches, and shall have not less than seven-eighths-inch-diameter tenons, or rungs of equivalent strength and bearing shall be provided. When rungs are 28 inches or more in length between side rails, they shall, in addition, be provided with center bearing.

(*e*) Oval rungs or rungs of any other cross section may be used provided they are secured by a nail at each end or the equivalent thereof, and have at least the same strength and bearing as round rungs of the same length.

(*f*) All metal parts and fittings shall be securely attached by means of rivets, bolts, screws, or equivalent fasteners.

(*g*) The construction and assembly of the movable parts shall be such that they shall operate freely and securely without binding or unnecessary play.

(*h*) When measured along the side rails, no rung ladder or section thereof shall be more than 4 inches shorter than the specified length.

(*i*) Nonslip bases shall be securely bolted, riveted, or attached by equivalent construction to the side rails.

(*j*) Hooks shall be securely bolted or riveted to the side rails or equivalent construction and shall be of such dimensions as to withstand the loads imposed upon them.

(ii) *Single ladder.* (*a*) Single ladders longer than 30 feet shall not be supplied.

(*b*) The minimum dimensions of the side rails of the single ladder shall be as follows when made of group 2 or group 3 woods:

Length of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 16	1⅛	2½
Over 16 up to and including 22	1¼	2¾
Over 22 up to and including 30	1¼	3

(*c*) Smaller side rails will be acceptable in all ladders of this type when reinforced by a steel wire, rod, or strap running the length of the side rails and adequately secured thereto. Where such reinforcement is used, the reinforced rails shall be equivalent in strength to the side rails specified in this subdivision (ii) (*b*).

(*d*) The width between the side rails at the base, inside to inside, shall be at least 11½ inches for all ladders up to and including 10 feet. Such minimum widths shall be increased at least one-fourth inch for each additional 2 feet of length.

(iii) *Two-section ladder.* (*a*) Two-section extension ladders longer than 60 feet shall not be supplied. All ladders of this type shall consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered.

(*b*) The minimum dimensions of the side rails of the two-section extension ladder shall be not less than specified in Table D-4 of this section.

(*c*) The minimum dimensions of side rails set forth in Table D-4 are based on the maximum working length, which is the size of ladder less the minimum overlap, which shall be as follows:

Size of ladder (feet):	*Overlap (feet)*
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

(*d*) Smaller side rails will be acceptable in all ladders of this type when reinforced by a steel wire, rod, or strap running the length of the side rails and adequately secured thereto. Where such reinforcement is used, the reinforced rails shall be equivalent in strength to the side rails specified in Table D-4.

(*e*) The minimum distance between side rails of the bottom section, inside to inside, shall be 14½ inches on ladders up to and including 28 feet; 16 inches on all ladders over 28 feet up to and including 40 feet; 18 inches on all ladders over 40 feet.

(*f*) All locks and guide irons shall be of metal and shall be of such construction and strength as to develop the full strength of the side rails. All locks shall be positive in their action. The guide irons shall be securely attached and so placed as to prevent the upper section from tipping or falling out while raising, lowering, or in use.

(*g*) (*1*) Ladders of this type may be equipped with a rope and pulley, which shall be securely attached to the ladder in such manner as not to weaken either the rungs or the side rails. The pulley shall be not less than 1¼ inches in diameter.

(*2*) The rope used with the pulley shall be not less than five-sixteenths inch in diameter having a minimum breaking strength of 560 pounds, and shall be sufficient length for the purpose intended.

(iv) *Sectional Ladder.* (*a*) Assembled combinations of sectional ladders longer than lengths specified in this subdivision shall not be used.

(*b*) The minimum dimensions of side rails shall be as follows for Group 2 or Group 3 woods:

Assembled length of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 21	1⅛	2¾
Over 21 up to and including 31	1⅛	3⅛

(*c*) Ladders of this type shall have either straight sides slightly converging toward the top of each section, or shall have flaring sides at the bottom of the first (or bottom) section, with the top section having converging side rails to a width that shall be not less than 4 inches. Except for the top section, the minimum width between side rails shall be 11 inches.

(*1*) Adjacent sections shall be jointed by means of a groove in the bottom end of each rail of the upper of the two sections setting firmly over extensions outside the side rails, of the topmost rung of the next lower section and, at the same time, a groove in the top end of each rail of the lower of the two sections setting firmly over the bottom rung, inside the side rails, of the section next above.

TABLE D-4—DIMENSIONS OF SIDE RAILS FOR TWO-SECTION LADDER

Size of ladder, overall length (feet)	Rail		
	Thickness (inches)		Depth (inches)
For group 2 woods			
16	1 1/16	×	2
20	1 1/16	×	2¼
24	1 1/16	×	2½
28	1 1/16	×	2¾
32	1⅛	×	2¾
36	1 5/16	×	2¾
40	1 5/16	×	2¾
44	1 5/16	×	3
For group 3 woods			
16	1⅛	×	2
20	1⅛	×	2¼
24	1⅛	×	2½
28	1⅛	×	2¾
32	1 5/16	×	2¾
36	1 5/16	×	3
40	1⅜	×	3
44	1⅜	×	3¼
48-52	1⅜	×	3¾
56-60	1⅝	×	3¾

(*2*) The distance between the two rungs (top-most rung of one section, bottom rung of the section next above) mentioned in this subdivision (iv) (c) (*1*) shall not be less than 1 foot.

(*3*) The fit between rail grooves and rungs mentioned in this subdivision (iv) (*c*) (*1*) shall be such as to provide a good fit without binding or unnecessary play.

(*4*) The grooved ends of the sections shall be reinforced with a metal plate of not less than 18-gauge (Manufacturing Standard) material properly secured thereto, and a rivet adjacent to the groove, extending through the depth of the rail, or the equivalent thereof.

(v) *Trestle and extension trestle ladder.* (*a*) Trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet shall not be supplied.

(*b*) The minimum dimensions of the side rails of the trestle ladder, or the base sections of the extension trestle ladder, shall be as follows for Group 2 or Group 3 woods:

Size of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 16	1 5/16	2¾
Over 16 up to and including 20	1 5/16	3

The minimum dimensions of the side rails of the extension section of the extension trestle ladder, which shall have parallel sides, shall be as follows for Group 2 or Group 3 woods:

Size of ladder (feet)	Thickness (inches)	Depth (inches)
Up to and including 12	1 5/16	2¼
Over 12 up to and including 16	1 5/16	2½
Over 16 up to and including 20	1 5/16	2¾

(*c*) Trestle ladders and base sections of extension trestle ladders shall be so spread that when in an open position the spread of the trestle at the bottom, inside to inside, shall be at least 5½ inches per foot of the length of the ladder.

(*d*) The width between the side rails at the base of the trestle ladder and base sections of the extension trestle ladder shall be at least 21 inches for all ladders and sections up to and including 6 feet. Longer lengths shall be increased at least 1 inch for each additional foot of length. The width between the side rails of the extension sections of the trestle ladder shall be not less than 12 inches.

(*e*) The tops of the side rails of the trestle ladder and of the base section of the extension trestle ladder shall be beveled, or equivalent construction, and shall be provided further with a metal hinge to prevent spreading.

(*f*) A metal spreader or locking device to hold the front and back sections in an open position, and to hold the extension section securely in the elevated position, shall be a component of all extension trestle ladders and all trestle ladders over 12 feet in length.

(*g*) Rungs shall be parallel and level. On the trestle ladder, or on the base sections of the extension trestle ladder, rungs shall be spaced not less than 8 inches or more than 18 inches apart; on the extension section of the extension trestle ladder, rungs shall be spaced not less than 6 inches or more than 12 inches apart.

(4) *Special-purpose ladders.* All special-purpose ladders shall comply with the appropriate requirements of subparagraphs (1), (2), and (3) of this paragraph, except as hereinafter modified in this subparagraph.

(i) *Platform stepladder.* A platform stepladder is a modification of a portable stepladder with a working platform provided near the top.

(*a*) Platform stepladders shall be made in accordance with the requirements of type I stepladders or in accordance with the requirements for type II stepladders.

(*b*) The slope of the back section shall be such that a vertical from the back edge of the platform will strike the floor at a distance measured toward the front section of not less than 3 inches from the base of the back section.

(*c*) The minimum width between side rails at the platform shall be not less than 15 inches.

(*d*) The back legs and side rails shall extend at least 24 inches above the platform and shall be connected with a top member to form a three-sided rail, or equivalent construction shall be provided.

(*e*) Platforms shall be so constructed as to be capable of supporting a load of 200 pounds placed at any point on the platform.

(*f*) A separate spreader may be omitted from platform ladders in which the height to the platform is 6 feet or less. If the spreader is omitted, the platform shall be so designed as to function as a spreader or locking device to hold the front and back sections securely in an open position, with the connection between side rails and back legs being through the metal parts of the platform. The wood parts of a combined wood and metal platform functioning as a spreader shall not be depended upon to contribute to the spreading or locking action.

(ii) *Painter's stepladder.* (*a*) Painter's stepladders longer than 12 feet shall not be supplied.

(*b*) Painter's stepladders shall be made in accordance with the requirements of type II stepladders except for the following:

(*1*) The top may be omitted.

(*2*) A rope spreader may be substituted for the metal spreader required in subparagraph (2)(i)(*f*) of this paragraph. The rope shall not be less than No. 6 sash cord or its equivalent.

(iii) *Mason's ladder.* A mason's ladder is a special type of single ladder intended for use in heavy construction work.

(*a*) Mason's ladders longer than 40 feet shall not be supplied.

(*b*) The minimum dimensions of the side rails when made of Group 2 or Group 3 woods and rungs (Group 1 woods) of the mason's ladder shall be as follows:

Length of ladder (feet)	Side rails		Diameter	
	Thickness (inches)	Depth (inches)	Rung (inches)	Tenon (inches)
Up to and including 22	1⅝	3⅝	1⅛	1
Over 22 up to and including 40	1⅝	4½	1⅛	1

(*c*) The width between the side rails at the bottom rung, inside to inside, shall be not less than 12 inches for all ladders up to and including 10 feet. Such minimum widths shall be increased by at least one-fourth inch for each additional 2 feet of length.

(*d*) Rungs shall be parallel and level and shall be spaced not less than 8 inches or more than 12 inches apart.

(5) *Trolley and side-rolling ladders*—(i) *Length.* Trolley ladders and side-rolling ladders longer than 20 feet should not be supplied.

(ii) *Dimensions.* The dimensions of the side rails shall not be less than the following for Group 2 or Group 3 woods:

Length of side rails (feet)	Thickness (inch)	Depth (inches)
Up to and including 10	25/32	3
Over 10 up to and including 20	25/32	3¾

The minimum thicknesses of side rails provide for the cutting of a groove not over one-eighth inch in depth and shall be increased when grooves of greater depth are used. Flat steps shall have the following minimum dimensions for Group 2 or Group 3 woods:

Length of step (inches)	Thickness (inch)	Width (inches)
Up to and including 16	25/32	3
Over 16 up to and including 20	25/32	3¼
Over 20 up to and including 24	25/32	3½
Over 24 up to and including 28	25/32	4

(iii) *Width.* The width between the side rails, inside to inside, shall be at least 12 inches.

(iv) *Step attachment.* Flat steps shall be inset in the side rails one-eighth inch and secured with at least two 6-d nails at each end or the equivalent thereof. They shall be reinforced with angle braces or a 3/16-inch steel rod.

(v) *Locking device.* Locking devices should be provided on all trolley ladders.

(vi) *Tracks.* (*a*) Tracks shall be wood, or metal (excluding cast iron), or a combination of these materials.

(*b*) Tracks for the top end of ladders shall be fastened securely and shall be so constructed that the wheels will not jump the track. Tracks shall be so designed as to provide for all probable loads to which they will be subjected.

(*c*) The supports shall be securely fastened by lag screws, machine, hook, or toggle bolts, or their equivalent.

(*d*) Track for side-rolling ladders shall be supported by metal or wood brackets securely screwed or bolted to shelving or other permanent structure at not over 3 feet.

(vii) *Wheel carriages.* (*a*) Wheel carriages shall be so designed as to provide for all loads to which they will be subjected. Two-point suspension should be used.

(*b*) The wheel carriage for the top end of the ladder shall be securely fastened to the top of the ladder with metal brackets bolted either to the side rails or to the top step. When bolted to the top step, this step shall be secured to the side rails with metal braces in addition to those otherwise provided. The wheel carriage shall be so designed that a loose or broken wheel will not allow the ladder to drop or become detached from the track.

(*c*) The wheel carriage for the bottom end of the ladder shall be securely fastened to the bottom of the ladder.

(*d*) The wheels at the upper end of the ladder shall have minimum wheel base of 8 inches.

(*e*) When wheels are used at the bottom of the ladder, there shall be at least one wheel supporting each side rail.

(*f*) Running gear for bottoms of both trolley and side-rolling ladders shall be so designed and constructed as to provide for any load to which they will be subjected.

(d) *Care and use of ladders*—(1) *Care.* To insure safety and serviceability the following precautions on the care of ladders shall be observed:

(i) Ladders shall be maintained in good condition at all times, the joint between the steps and side rails shall be tight, all hardware and fittings securely attached, and the movable parts shall operate freely without binding or undue play.

(ii) Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.

(iii) Frayed or badly worn rope shall be replaced.

(iv) Safety feet and other auxiliary equipment shall be kept in good condition to insure proper performance.

(v) Ladders should be stored in such a manner as to provide ease of access or inspection, and to prevent danger of accident when withdrawing a ladder for use.

(vi) Wood ladders, when not in use, should be stored at a location where they will not be exposed to the elements, but where there is good ventilation. They shall not be stored near radiators, stoves, steam pipes, or other places subjected to excessive heat or dampness.

(vii) Ladders stored in a horizontal position should be supported at a sufficient number of points to avoid sagging and permanent set.

(viii) Ladders carried on vehicles should be adequately supported to avoid sagging and securely fastened in position to minimize chafing and the effects of road shocks.

(ix) Ladders should be kept coated with a suitable protective material. The painting of ladders is satisfactory providing the ladders are carefully inspected prior to painting by competent and experienced inspectors acting for, and responsible to, the purchaser, and providing the ladders are not for resale.

(x) Ladders shall be inspected frequently and those which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "Dangerous, Do Not Use."

(xi) Rungs should be kept free of grease and oil.

(2) *Use.* The following safety precautions shall be observed in connection with the use of ladders:

(i) Portable rung and cleat ladders shall, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support). The ladder shall be so placed as to prevent slipping, or it shall be lashed, or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds;

(ii) Ladders for which dimensions are specified should not be used by more than one man at a time nor with ladder jacks and scaffold planks where use by more than one man is anticipated. In such cases, specially designed ladders with larger dimensions of the parts should be procured;

(iii) Portable ladders shall be so placed that the side rails have a secure footing. The top rest for portable rung and cleat ladders shall be reasonably rigid and shall have ample strength to support the applied load;

(iv) Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked upon, locked, or guarded.

(v) Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height;

(vi) To support the top of the ladder at a window opening, a board should be attached across the back of the ladder, extending across the window and providing firm support against the building walls or window frames;

(vii) When ascending or descending, the user should face the ladder;

(viii) Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made.

(ix) Short ladders shall not be spliced together to provide long sections;

(x) Ladders made by fastening cleats across a single rail shall not be used;

(xi) Ladders shall not be used as guys, braces, or skids, or for other than their intended purposes ;

(xii) Tops of the ordinary types of stepladders shall not be used as steps;

(xiii) On two-section extension ladders the minimum overlap for the two sections in use shall be as follows:

Size of ladder (feet):	*Overlap (feet)*
Up to and including 36	3
Over 36 up to and including 48	4
Over 48 up to and including 60	5

(xiv) Portable rung ladders with reinforced rails (see paragraphs (c)(3)(ii)(*c*) and (iii)(*d*) this section) shall be used only with the metal reinforcement on the under side. Ladders of this type should be used with great care near electrical conductors, since the reinforcing itself is a good conductor;

(xv) No ladder should be used to gain access to a roof unless the top of the ladder shall extend at least 3 feet above the point of support, at eave, gutter, or roof line;

(xvi) Adjustment of extension ladders should only be made by the user when standing at the base of the ladder, so that the user may observe when the locks are properly engaged. Adjustment of extension ladders from the top of the ladder (or any level over the locking device) is a dangerous practice and should not be attempted. Adjustment should not be made while the user is standing on the ladder.

(xvii) Middle and top sections of sectional or window cleaner's ladders should not be used for bottom section unless the user equips them with safety shoes.

(xviii) Extension ladders should always be erected so that the upper section is resting on the bottom section.

(xix) The user should equip all portable rung ladders with nonslip bases when there is a hazard of slipping. Nonslip bases are not intended as a substitute for care in safely placing, lashing, or holding a ladder that is being used upon oily, metal, concrete, or slippery surfaces.

(xx) The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing.

(xxi) When service conditions warrant, hooks may be attached at or near the top of portable ladders to give added security.

TABLE D-5—CLASSIFICATION OF VARIOUS SPECIES OF WOOD ACCEPTABLE FOR USE IN LADDERS

The species are listed alphabetically within each group. The position of any species within a group therefore bears no relation to its strength or acceptability.

Where ladders are desired for use under conditions favorable to decay, it is recommended that the heartwood of decay-resistant species be used, or that the wood be given a treatment with a wood preservative. The species having the most durable heartwood are marked with an asterisk (*), and these should be preferred where resistance to decay is required.

GROUP 1

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed 2,150 pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions may be not more than 10 percent smaller for each cross-section dimension, or the thickness may remain unchanged, in which case the width may not be more than 15 percent smaller if used edgewise (as in a rail) or 25 percent smaller if used flatwise (as in a tread).

White ash	Fraxinus americana, pennsylvanica, quadrangulata
Beech	Fagus grandifolia
Birch	Betula lenta, alleghaniensis, nigra (2)
Rock elm	Ulmus thomasii
Hickory	Carya ovata, laciniosa, tomentosa, glabra
Locust*	Robinia pseudoacacia, Gleditsia triacanthos
Hard maple	Acer nigrum, saccharum
Red maple	Acer rubrum (3)
Red oak	Quercus velutina, marilandica, kelloggii, falcata var. pagodaefolia, laurifolia, ellipsoidalis, rubra, nuttallii, palustris, coccinea, shumardii, falcata, laevis, phellos
White oak	Quercus arizonica, douglasii, macrocarpa, lobata, prinus, muehlenbergii, emoryi, gambelii, oblongifolia, virginiana, garryana, lyrata, stellata, michauxii, bicolor, alba
Pecan	Carya illinoensis, cordiformis, myristicaeformis (4), aquatica (4)
Persimmon	Diospryros virginiana

GROUP 2

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed 2,000 pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions may be not more than 7½ percent smaller for each cross-section dimension, or the thickness may remain unchanged, in which case the width may be not more than 11 percent smaller if used edgewise (as in a rail) or 20 percent smaller if used flatwise (as in a tread).

Douglas fir (coast region)	Pseudotsuga menziesii
Western larch	Larix occidentalis
Southern yellow pine	Pinus taeda, palustris, echinata, elliotii, rigida, virginiana

GROUP 3

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed 1,600 pounds per square inch.

Red alder	Alnus ruba, rhombifolia (2)
Oregon ash	Fraxinus latifolia
Pumpkin ash	Fraxinus profunda
Alaska cedar*	Chamaecyparis nootkatensis
Port Orford cedar.*	Chamaecyparis lawsoniana

Cucumber	Magnolia acuminata
Cypress*	Taxodium distichum
Soft elm	Ulmus americana. rubra
Douglas fir (Rocky Mountain type).	Pseudotsuga menziesii var. glauca
Noble fir	Abies procera
Gum	Liquidambar styraciflua
West coast hemlock.	Tsuga heterophylla
Magnolia	Magnolia grandiflora
Oregon maple	Acer macrophyllum
Norway pine	Pinus resinosa
Poplar	Liriodendron tulipifera
Redwood*	Sequoia sempervirens
Eastern spruce	Picea glauca, rubens
Sitka spruce	Picea sitchensis
Sycamore	Platanus occidentalis
Tamarack	Larix laricina
Tupelo	Nyssa aquatica, sylvatica

GROUP 4

The allowable fiber stress in bending for the species listed herein when used for side rails shall not exceed 1,375 pounds per square inch. These species may be substituted for Group 3 woods on the following basis: The dimensions shall be at least 5 percent greater for each cross-section dimension, or the thickness may remain unchanged, in which case the width shall be at least 7½ percent greater if used edgewise (as in a rail) or 15 percent greater if used flatwise (as in a tread).

Aspen	Populus tremuloides, grandidentata
Basswood	Tilia americana, heterophylla (2)
Buckeye	Aesculus octandra, glabra (2)
Butternut	Juglanscinerea
Incense cedar*	Libocedrus decurrens
Western red cedar.*	Thuja plicata
Cottonwood	Populus balsamifera, deltoides, sargentii, heterophylla
White fir	Abies concolor, grandis, amabilis, lasiocarpa, magnifica
Hackberry	Celtis occidentalis, laevigata (2)
Eastern hemlock	Tsuga canadensis
Holly	Ilex opaca
Soft maple	Acer saccharinum
Lodgepole pine	Pinus contorta
Idaho white pine	Pinus monticola
Northern white pine.	Pinus strobus
Ponderosa pine	Pinus ponderosa, pinus jeffreyi (Jeffrey pine)
Sugar pine	Pinus lambertiana
Engelmann spruce.	Picea engelmannii

Note 1: The common and scientific names of species used conform to the American Lumber Standards nomenclature and in most cases to U.S. Department of Agriculture Handbook No. 41, "Check List of Native and Naturalized Trees of the United States (including Alaska)," by Elbert L. Little. These publications can be obtained from the Superintendent of Documents, Washington, D.C. 20225.

Note 2: This species is commonly associated with others of the same genus under American Lumber Standards nomenclature, but no strength tests have been made on it at the Forest Products Laboratory.

Note 3: Included under soft maple in American Lumber Standards nomenclature.

Note 4: This species is not included under this common name in American Lumber Standards nomenclature, but strength data are available and it is accordingly included in this classification.

§ 1910.26 Portable metal ladders.

(a) *Requirements*—(1) *General*. Specific design and construction requirements are not part of this section because of the wide variety of metals and design possibilities. However, the design shall be such as to produce a ladder without structural defects or accident hazards such as sharp edges, burrs, etc. The metal selected shall be of sufficient strength to meet the test requirements, and shall be protected against corrosion unless inherently corrosion-resistant.

(i) Because of the varied conditions, and the wide variety of ladder uses, ladders may be designed with parallel side rails, with side rails varying uniformly in separation along the length (tapered), or with side rails flaring at the base to increase stability.

(ii) The design of the side rails shall be such as to insure a product which will conform to the requirements of this section.

(iii) The spacing of rungs or steps shall be on 12-inch centers.

(iv) Rungs or steps to side rail connections should be so constructed as to insure rigidity as well as strength.

(v) Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.

(vi) Hardware shall meet strength requirements of the ladder's component parts, and shall be of a material that is protected against corrosion unless inherently corrosion-resistant. Metals shall be so selected as to avoid excessive galvanic action.

(2) *General specifications — straight and extension ladders*. (i) The minimum width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.

(ii) The length of single ladders or individual sections of ladders shall not exceed 30 feet. Two-section ladders shall not exceed 48 feet in length and over two-section ladders shall not exceed 60 feet in length.

(iii) Based on the nominal length of the ladder, each section of a multisection ladder shall overlap the adjacent section by at least the number of feet stated in the following:

Nominal length of ladder (feet):	*Overlap (feet)*
Up to and including 36	3
Over 36, up to and including 48	4
Over 48, up to 60	5

(iv) Extension ladders shall be equipped with positive stops which will insure the overlap specified in the table above.

(v) (*a*) Extension ladders may be equipped with a rope and pulley which shall be securely attached to the ladder in such a manner as not to weaken either the rungs or the side rails. The pulley shall be not less than 1¼ inches in diameter.

(*b*) The rope used with the pulley shall be not less than five-sixteenths inch in diameter, having a minimum breaking strength of 560 pounds, and shall be of sufficient length for the purpose intended.

(3) *General specifications—step ladders*. (i) Step ladders shall be designed and constructed to give a minimum slope of 3½ inches per foot of length of the front section, and a minimum slope of 2 inches per foot of length of the back section, except that special ladders designed for straight-in-wall work shall maintain at least 1¼-inch back slope per foot of length.

(ii) The minimum width between the side rails at the top step shall be 12 inches. The width spread of the side rails shall increase a minimum of 1 inch per foot of length. The width of the step or tread shall not be less than 3 inches.

(iii) The length of a stepladder is measured by the length of the front rail. To be classified as a standard length ladder, the measured length shall be within plus or minus one-half inch of the specified length. Stepladders shall not exceed 20 feet in length.

(iv) The pail shelf shall be designed to fold completely within the ladder.

(v) The back section may be designed with either rungs or cross bracing as long as it meets the general and testing requirements.

(vi) Steps shall be corrugated, knurled, dimpled, coated with skid-resistant materials, or otherwise treated to minimize the possibility of slipping.

(vii) The bottoms of the four rails are to be supplied with insulating nonslip material for the safety of the user.

(viii) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed to protect the user.

(4) *General specifications—trestles and extension trestle ladders*. (i) Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than 20 feet in length.

(ii) The minimum distance between side rails of the trestle or extension section at the narrowest point shall not be less than 12½ inches. The width spread shall not be less than 1 inch per foot of length of side rail.

(iii) Spread of base when section is open shall not be less than 5½ inches per foot of base section side rail.

(iv) The extension locking device shall be designed to withstand all load tests.

(v) A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each trestle ladder. The spreader shall have all sharp points or edges covered or removed to protect the user.

(5) *General specifications—platform ladders*. (i) The length of a platform ladder shall not exceed 20 feet. The length of a platform ladder shall be measured along the front rail from the floor to the platform.

(ii) Minimum width between side rails at platform level shall be 14 inches.

Width spread shall not be less than 1 inch per foot of rise.

(iii) Slope of the front rail when unit is in open position shall not be less than 3½ inches per foot of rise, and the back section shall have a minimum slope of 1 inch per foot of rise.

(iv) The platform shall be at least 20 inches from the top of the ladder, and shall have an area of not less than 200 square inches nor more than 400 square inches.

(v) The back legs and side rails of a platform ladder shall extend at least 20 inches above the platform and shall be connected with the top member to form a three-sided top guard rail, or equivalent construction shall be provided.

(vi) Spreaders shall be provided where the hinging apparatus is not designed to lock the unit open.

(b) *Testing.* (1) *General.* The following tests are intended to insure uniform testing methods for metal ladders.

(2) *Straight and extension ladders.* (i) Ladder inclined strength is measured by placing the ladder unit in a flat, horizontal position, supported 6 inches from the ends of the side rails. When testing extensions, the unit is opened to the required overlap. A load of 200 pounds is applied equally to the side rails at the center of the unit by means of a beam. The ladder must withstand this test with no permanent deformation or other visible weakening of the structure. This test is based on a 200-pound man using the ladder, set at 75½° to the ground. With the man on the center rung, the component of his 200-pound weight at right angles to the ladder will be 50 pounds. Applying the load factor of 4, the test weight becomes 200 pounds.

(ii) Test unit need only be of sufficient length for test purposes and is to consist of the base and fly sections of an extension ladder with all the hardware or fittings attached. The ladder unit is placed in a vertical position and a downward load of 775 pounds equally distributed on the ends of the side rails of the upper portion of the test unit. The unit shall withstand this test with no permanent deformation or other visible weakening of the structure.

(iii) A test unit of at least three rungs is to be used from the maximum width portion of the ladder. A load of 800 pounds shall be applied to a 3½-inch wide block resting on the center of the widest rung. A rung of 14 inches or less in length shall withstand this test with no permanent deformation or other visible weakening of the structure. A rung of more than 14 inches in length may have a permanent deflection of not more than one-eighth inch provided the rung cross section is not deformed and there is no other visible weakening of the structure.

(iv) With at least a three-rung test unit set in a vertical position, a load of 800 pounds shall be applied to a 3½-inch wide block resting on the center rung as near to the side rail as possible. On removing the load, the unit must show no indication of failure in the fasteners attaching the rungs to the side rail.

(v) The rung shall be so secured to the side rail that a torque load of 360 inch-pounds applied to the rung at a side rail shall cause no visible relative motion between the rung and the side rail.

(vi) With the ladder extended to its maximum working length, and resting horizontally on level supports located 6 inches from each end of the ladder, a weight of 50 pounds shall be suspended from one of the side rails midway between supports.
The deflection of the loaded rail, and the difference in deflection between the loaded and unloaded rails shall not exceed the values in Table D–6.

(vii) Deflections in Table D–6 are to be determined by measuring, at the midpoint between supports, the distance from the outside edges of both rails to the floor or other reference surface both before and after the test load of 50 pounds is applied to one rail of the ladder. The test is to be repeated loading the other rail of the ladder. The angle (a) between the loaded and unloaded rails and the horizontal is to be calculated from the trigonometric equation:

$$\text{Sine a} = \frac{\text{Difference in deflection}}{\text{Ladder width}}$$

(3) *Step, trestle, extension trestle, and platform ladders.* (i) (*a*) Load test of the entire ladder is made with the ladder in an open position, and an 800-pound load applied to the center of the top. Resistance to side rail bending is tested by placing an 800-pound load on the center of the middle step. The strength of the step section is tested by applying an 800-pound load to a 3½-inch-wide block resting on the center of the longest or bottom step. The pail shelf shall be so constructed as to support a distributed load of 50 pounds.

(*b*) In each test case, the unit must withstand the load without failure or permanent deformation.

(ii) Set ladder in open position on a level floor. Place a 200-pound distributed load on the top step. The ladder is then subjected to a horizontal pulling load, applied at the top step, of 12-pound force to the side; 58-pound force to the front; 33-pound force to the back. In each test, all side rails must remain on the floor.

TABLE D-6—TABLE OF DEFLECTIONS

Length of ladder in feet	Maximum deflection of loaded rail in inches	Maximum difference in deflection between loaded and unloaded rails in degrees from horizontal
20	3.0	3.6
24	3.8	4.7
28	4.6	5.4
32	5.5	5.7
36	6.4	6.1
40	7.2	6.5
44	8.0	6.5
48	8.8	6.5

(c) *Care and maintenance of ladders*—(1) *General.* To get maximum serviceability, safety, and to eliminate unnecessary damage of equipment, good safe practices in the use and care of ladder equipment must be employed by the users.

The following rules and regulations are essential to the life of the equipment and the safety of the user.

(2) *Care of ladders.* (i) Ladders, like any tool, must be handled with care and not subject to unnecessary dropping, jarring, or misuse. They are designed for a specific purpose or use; therefore, any variation from this use constitutes a mishandling of the equipment.

(ii) Ladders should be stored on racks designed to protect the ladder when not in use. The racks should have sufficient supporting points to prevent any possibility of excessive sagging.

(iii) Ladders transported on vehicles must be properly supported. Supporting points should be of a softer material, such as hardwood or rubber-covered iron pipe, to minimize the chafing and effects of road shock. Tying the ladder to each support point will greatly reduce damage due to road shock.

(iv) Ladders must be maintained in good usable condition at all times. Hardware fittings and accessories should be checked frequently and kept in good working condition.

(v) Ropes or cables should be inspected frequently and replaced if defective.

(vi) Complete ladder inspection should be periodical. If a ladder is involved in any of the following, immediate inspection is necessary:

(*a*) If ladders tip over, inspect ladder for side rails dents or bends, or excessively dented rungs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.

(*b*) If ladders are exposed to excessive heat as in the case of fire, the ladder should be inspected visually for damage and tested for deflection and strength characteristics. In doubtful cases, refer to manufacturer.

(*c*) If ladders are to be subjected to certain acids or alkali solutions, a protective coating such as asphalt and varnish should be applied to the equipment.

(*d*) If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or slippery materials. This can easily be done with a solvent or steam cleaning.

(vii) Ladders having defects are to be marked and taken out of service until repaired by either maintenance department or the manufacturer.

(3) *Use of ladders.* (i) Portable non-self-supporting ladders should be erected at a pitch of 75½ degrees for maximum balance and strength. A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder.

(ii) Portable ladders are designed as a one-man working ladder based on a 200-pound load.

(iii) The ladder base section must be placed with a secure footing. Safety shoes of good substantial design should be installed on all ladders. Where ladders with no safety shoes or spikes are used on hard, slick surfaces, a foot-ladder board should be employed.

(iv) The top of the ladder must be placed with the two rails supported, unless equipped with a single support attachment. Such an attachment should be substantial and large enough to support the ladder under load.

(v) When ascending or descending, the climber must face the ladder.

(vi) Ladders must not be tied or fastened together to provide longer sections. They must be equipped with the hardware fittings necessary if the manufacturer endorses extended uses.

(vii) Ladders should not be used as a brace, skid, guy or gin pole, gangway, or for other uses than that for which they were intended, unless specifically recommended for use by the manufacturer.

(viii) Users are cautioned to take proper safety measures when metal ladders are used in areas containing electric circuits to prevent short circuits or electrical shock.

§ 1910.27 Fixed ladders.

(a) *Design requirements*—(1) *Design considerations*. All ladders, appurtenances, and fastenings shall be designed to meet the following load requirements:

(i) The minimum design live load shall be a single concentrated load of 200 pounds.

(ii) The number and position of additional concentrated live-load units of 200 pounds each as determined from anticipated usage of the ladder shall be considered in the design.

(iii) The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such points as will cause the maximum stress in the structural member being considered.

(iv) The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.

(2) *Design stresses*. Design stresses for wood components of ladders shall not exceed those specified in § 1910.25. All wood parts of fixed ladders shall meet the requirements of § 1910.25(b).

For fixed ladders consisting of wood side rails and wood rungs or cleats, used at a pitch in the range 75 degrees to 90 degrees, and intended for use by no more than one person per section, single ladders as described in § 1910.25(c)(3)(ii) are acceptable.

(b) *Specific features*—(1) *Rungs and cleats*. (i) All rungs shall have a minimum diameter of three-fourths inch for metal ladders, except as covered in subparagraph (7)(i) of this paragraph, and a minimum diameter of 1⅛ inches for wood ladders.

(ii) The distance between rungs, cleats, and steps shall not exceed 12 inches and shall be uniform throughout the length of the ladder.

(iii) The minimum clear length of rungs or cleats shall be 16 inches.

(iv) Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.

(v) The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. A suggested design is shown in figure D-1.

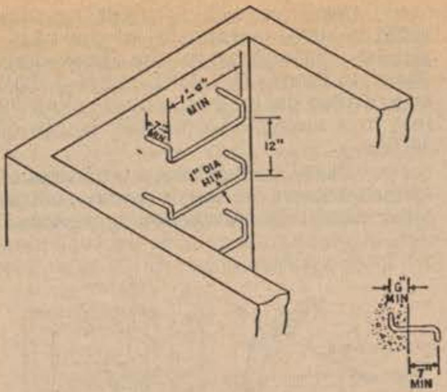


FIGURE D-1.—Suggested design for rungs on individual-rung ladders.

(2) *Side rails*. Side rails which might be used as a climbing aid shall be of such cross sections as to afford adequate gripping surface without sharp edges, splinters, or burrs.

(3) *Fastenings*. Fastenings shall be an integral part of fixed ladder design.

(4) *Splices*. All splices made by whatever means shall meet design requirements as noted in paragraph (a) of this section. All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

(5) *Electrolytic action*. Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined.

(6) *Welding*. All welding shall be in accordance with the "Code for Welding in Building Construction" (AWSD1.0–1966).

(7) *Protection from deterioration*. (i) Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands. Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting. To increase rung life in such atmosphere, individual metal rungs shall have a minimum diameter of 1 inch or shall be painted or otherwise treated to resist corrosion and rusting.

(ii) Wood ladders, when used under conditions where decay may occur, shall be treated with a nonirritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

(iii) When different types of materials are used in the construction of a ladder, the materials used shall be so treated as to have no deleterious effect one upon the other.

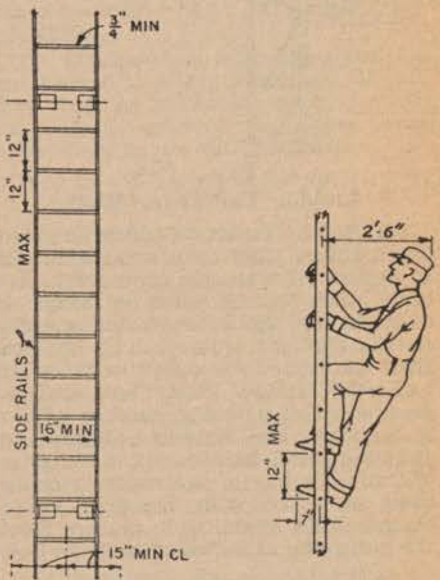
(c) *Clearance*—(1) *Climbing side*. On fixed ladders, the perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76 degrees, and 30 inches for a pitch of 90 degrees (fig. D-2 of this section), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope, except as provided in subparagraphs (3) and (5) of this paragraph.

(2) *Ladders without cages or wells*. A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary.

(3) *Ladders with cages or baskets*. Ladders equipped with cage or basket are excepted from the provisions of subparagraphs (1) and (2) of this paragraph, but shall conform to the provisions of paragraph (d)(1)(v) of this section. Fixed ladders in smooth-walled wells are excepted from the provisions of subparagraph (1) of this paragraph, but shall conform to the provisions of paragraph (d)(1)(vi) of this section.

(4) *Clearance in back of ladder*. The distance from the centerline of rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than 7 inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in figure D-3 shall be provided.

(5) *Clearance in back of grab bar*. The distance from the centerline of the grab bar to the nearest permanent ob-



RAIL LADDER WITH BAR STEEL RAILS AND ROUND STEEL RUNGS

FIG. D-2

Minimum Ladder Clearances

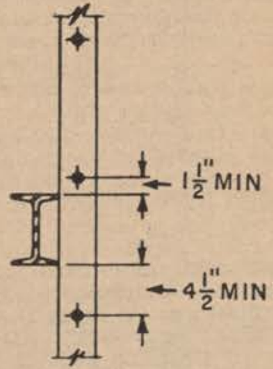


FIG. D-3

Clearance for Unavoidable Obstruction at Rear of Fixed Ladder

ject in back of the grab bars shall be not less than 4 inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.

(6) *Step-across distance.* The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 inches, or less than 2½ inches (fig. D-4).

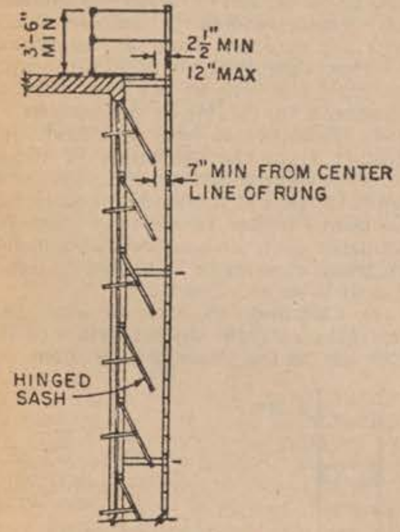
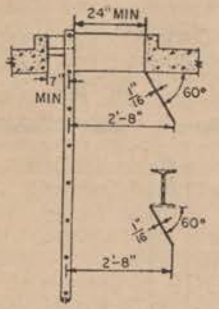


Fig. D-4

Ladder Far from Wall

(7) *Hatch cover.* Counterweighted hatch covers shall open a minimum of 60 degrees from the horizontal. The distance from the centerline of rungs or cleats to the edge of the hatch opening on the climbing side shall be not less than 24 inches for offset wells or 30 inches for straight wells. There shall be no protruding potential hazards within 24 inches of the centerline of rungs or cleats; any such hazards within 30 inches of the centerline of the rungs or cleats shall be fitted with deflector plates placed at an angle of 60 degrees from the horizontal as indicated in figure D-5.



Deflector Plates for Head Hazards

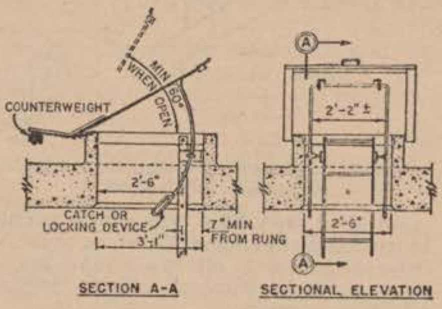
Fig. D-5

The relationship of a fixed ladder to an acceptable counterweighted hatch cover is illustrated in figure D-6.

(d) *Special requirements*—(1) *Cages or wells.* (i) Cages or wells (except on chimney ladders) shall be built, as shown on the applicable drawings, covered in detail in figures D-7, D-8, and D-9, or of equivalent construction.

(ii) Cages or wells (except as provided in subparagraph (5) of this paragraph) conforming to the dimensions shown in figures D-7, D-8, and D-9 shall be provided on ladders of more than 20 feet to a maximum unbroken length of 30 feet.

(iii) Cages shall extend a minimum of 42 inches above the top of landing, unless other acceptable protection is provided.

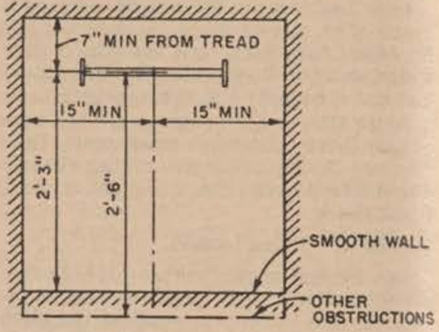


Relationship of Fixed Ladder to a Safe Access Hatch

Fig. D-6

(iv) Cages shall extend down the ladder to a point not less than 7 feet nor more than 8 feet above the base of the ladder, with bottom flared not less than 4 inches, or portion of cage opposite ladder shall be carried to the base.

(v) Cages shall not extend less than 27 nor more than 28 inches from the centerline of the rungs of the ladder. Cage shall not be less than 27 inches in width. The inside shall be clear of projections. Vertical bars shall be located at a maximum spacing of 40 degrees around the circumference of the cage; this will give a maximum spacing of approximately 9½ inches, center to center.



Clearance Diagram for Fixed Ladder in Well

Figure D-7

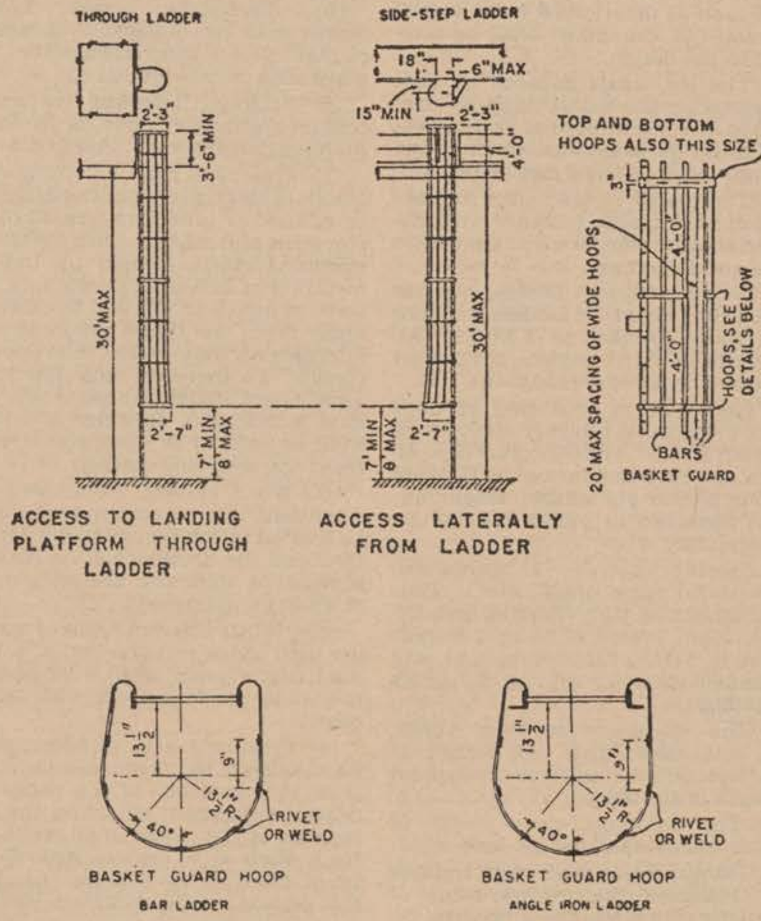


Fig. D-8

Cages for Ladders More Than 20 Feet High

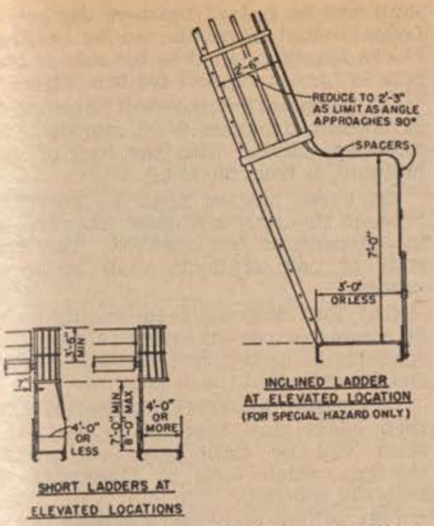

REDUCE TO 2'-3" AS LIMIT AS ANGLE APPROACHES 90°
2'-6"
SPACERS
7'-0"
5'-0" OR LESS
INCLINED LADDER AT ELEVATED LOCATION
(FOR SPECIAL HAZARD ONLY)
3'-6" MIN
4'-0" OR LESS
7'-0" MIN. 8'-0" MAX
4'-0" OR MORE
SHORT LADDERS AT ELEVATED LOCATIONS

FIGURE D-9.—Cages—Special applications.

(vi) Ladder wells shall have a clear width of at least 15 inches measured each way from the centerline of the ladder. Smooth-walled wells shall be a minimum of 27 inches from the centerline of rungs to the well wall on the climbing side of the ladder. Where other obstructions on the climbing side of the ladder exist, there shall be a minimum of 30 inches from the centerline of the rungs.

(2) *Landing platforms.* When ladders are used to ascend to heights exceeding 20 feet (except on chimneys), landing platforms shall be provided for each 30 feet of height or fraction thereof, except that, where no cage, well, or ladder safety device is provided, landing platforms shall be provided for each 20 feet of height or fraction thereof. Each ladder section shall be offset from adjacent sections. Where installation conditions (even for a short, unbroken length) require that adjacent sections be offset, landing platforms shall be provided at each offset.

(i) Where a man has to step a distance greater than 12 inches from the centerline of the rung of a ladder to the nearest edge of structure or equipment, a landing platform shall be provided. The minimum step-across distance shall be 2½ inches.

(ii) All landing platforms shall be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder. Platforms shall be not less than 24 inches in width and 30 inches in length.

(iii) One rung of any section of ladder shall be located at the level of the landing laterally served by the ladder. Where access to the landing is through the ladder, the same rung spacing as used on the ladder shall be used from the landing platform to the first rung below the landing.

(3) *Ladder extensions.* The side rails of through or side-step ladder extensions shall extend 3½ feet above parapets and landings. For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than 18 nor more than 24 inches clearance between rails. For side-step or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the 3½ feet minimum (fig. D–10).

(4) *Grab bars.* Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab-bar diameters shall be the equivalent of the round-rung diameters.

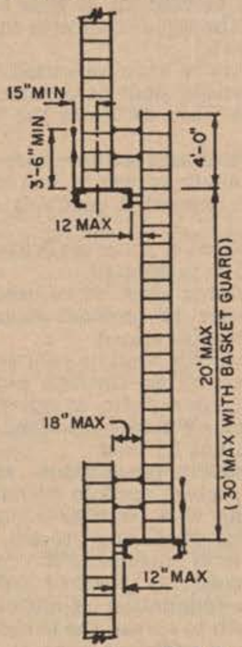


FIG. D-10

Offset Fixed Ladder Sections

(5) *Ladder safety devices.* Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate lifebelts, friction brakes, and sliding attachments shall meet the design requirements of the ladders which they serve.

(e) *Pitch*—(1) *Preferred pitch.* The preferred pitch of fixed ladders shall be considered to come in the range of 75 degrees and 90 degrees with the horizontal (fig. D–11).

(2) *Substandard pitch.* Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of 60 and 75 degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range shall be considered as a critical range to be avoided, if possible.

(3) *Scope of coverage in this section.* This section covers only fixed ladders within the pitch range of 60 degrees and 90 degrees with the horizontal.

(4) *Pitch greater than 90 degrees.* Ladders having a pitch in excess of 90 degrees with the horizontal are prohibited.

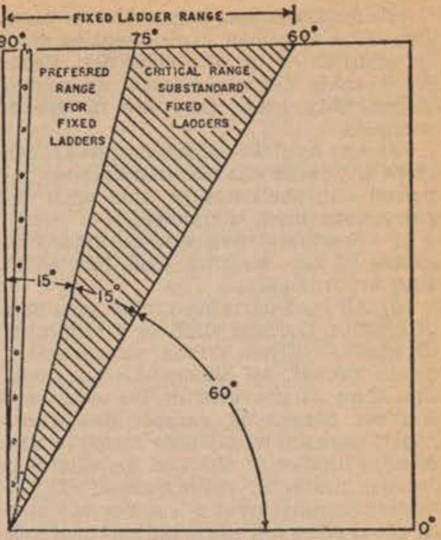

FIXED LADDER RANGE
90°
75°
60°
PREFERRED RANGE FOR FIXED LADDERS
CRITICAL RANGE SUBSTANDARD FIXED LADDERS
15°
15°
60°
0°

FIG. D-11

Pitch of Fixed Ladders

(f) *Maintenance.* All ladders shall be maintained in a safe condition. All ladders shall be inspected regularly, with the intervals between inspections being determined by use and exposure.

§ 1910.28 Safety requirements for scaffolding.

(a) *General requirements for all scaffolds.* (1) Scaffolds shall be furnished and erected in accordance with this standard for persons engaged in work that cannot be done safely from the ground or from solid construction, except that ladders used for such work shall conform to § 1910.25 and § 1910.26.

(2) The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.

(3) Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor except:

(i) Scaffolding wholly within the interior of a building and covering the entire floor area of any room therein and not having any side exposed to a hoistway, elevator shaft, stairwell, or other floor openings, and

(ii) Needle-beam scaffolds and floats in use by structural iron workers.

Guardrails should all be 2 x 4 inches or the equivalent, installed no less than 36 inches or not more than 42 inches high, with a midrail, when required, of 1- x 4-inch lumber or equivalent. Supports should be at intervals not to exceed ten feet. Toeboards shall be a minimum of 4 inches in height.

(4) Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.

(5) Scaffolds and other devices mentioned or described in this section shall be maintained in safe condition. Scaffolds shall not be altered or moved horizontally while they are in use or occupied.

(6) Any scaffold damaged or weakened from any cause shall be immediately repaired and shall not be used until repairs have been completed.

(7) Scaffolds shall not be loaded in excess of the working load for which they are intended.

(8) All load-carrying timber members of scaffold framing shall be a minimum of 1,500 *f.* (Stress Grade) construction grade lumber. All dimensions are nominal sizes as provided in the American Lumber Standards, except that where rough sizes are noted, only rough or undressed lumber of the size specified will satisfy minimum requirements. (NOTE: Where nominal sizes of lumber are used in place of rough sizes, the nominal size lumber shall be such as to provide equivalent strength to that specified in tables D–7 through D–12 and D–16.)

(9) All planking shall be Scaffold Grade as recognized by grading rules for the species of wood used. The maximum permissible spans for 2- x 9-inch or wider planks are shown in the following table:

	Material				
	Full thickness undressed lumber			Nominal thickness lumber	
Working load (p.s.f.)	25	50	75	25	50
Permissible span (ft.)	10	8	6	8	6

The maximum permissible span for 1¼ x 9-inch or wider plank of full thickness is 4 feet with medium loading of 50 p.s.f.

(10) Nails or bolts used in the construction of scaffolds shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the scaffold. Nails shall not be subjected to a straight pull and shall be driven full length.

(11) All planking or platforms shall be overlapped (minimum 12 inches) or secured from movement.

(12) An access ladder or equivalent safe access shall be provided.

(13) Scaffold planks shall extend over their end supports not less than 6 inches nor more than 18 inches.

(14) The poles, legs, or uprights of scaffolds shall be plumb, and securely and rigidly braced to prevent swaying and displacement.

(15) Materials being hoisted onto a scaffold shall have a tag line.

(16) Overhead protection shall be provided for men on a scaffold exposed to overhead hazards.

(17) Scaffolds shall be provided with a screen between the toeboard and the guardrail, extending along the entire opening, consisting of No. 18 gauge U.S. Standard Wire one-half-inch mesh or the equivalent, where persons are required to work or pass under the scaffolds.

(18) Employees shall not work on scaffolds during storms or high winds.

(19) Employees shall not work on scaffolds which are covered with ice or snow, unless all ice or snow is removed and planking sanded to prevent slipping.

(20) Tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.

(21) Only treated or protected fiber rope shall be used for or near any work involving the use of corrosive substances or chemicals.

(22) Wire or fiber rope used for scaffold suspension shall be capable of supporting at least six times the intended load.

(23) When acid solutions are used for cleaning buildings over 50 feet in height, wire rope supported scaffolds shall be used.

(24) The use of shore scaffolds or lean-to scaffolds is prohibited.

(25) Lumber sizes, when used in this section, refer to nominal sizes except where otherwise stated.

(26) Scaffolds shall be secured to permanent structures, through use of anchor bolts, reveal bolts, or other equivalent means. Window cleaners' anchor bolts shall not be used.

(27) Special precautions shall be taken to protect scaffold members, including any wire or fiber ropes, when using a heat-producing process.

(b) *General requirements for wood pole scaffolds.* (1) Scaffold poles shall bear on a foundation of sufficient size and strength to spread the load from the poles over a sufficient area to prevent settlement. All poles shall be set plumb.

(2) Where wood poles are spliced, the ends shall be squared and the upper section shall rest squarely on the lower section. Wood splice plates shall be provided on at least two adjacent sides and shall not be less than 4 feet 0 inches in length, overlapping the abutted ends equally, and have the same width and not less than the cross-sectional area of the pole. Splice plates of other materials of equivalent strength may be used.

(3) Independent pole scaffolds shall be set as near to the wall of the building as practicable.

(4) All pole scaffolds shall be securely guyed or tied to the building or structure. Where the height or length exceeds 25 feet, the scaffold shall be secured at intervals not greater than 25 feet vertically and horizontally.

(5) Putlogs or bearers shall be set with their greater dimensions vertical, long enough to project over the ledgers of the inner and outer rows of poles at least 3 inches for proper support.

(6) Every wooden putlog on single pole scaffolds shall be reinforced with a 3/16 x 2-inch steel strip or equivalent secured to its lower edge throughout its entire length.

(7) Ledgers shall be long enough to extend over two pole spaces. Ledgers shall not be spliced between the poles. Ledgers shall be reinforced by bearing blocks securely nailed to the side of the pole to form a support for the ledger.

(8) Diagonal bracing shall be provided to prevent the poles from moving in a direction parallel with the wall of the building, or from buckling.

(9) Cross bracing shall be provided between the inner and outer sets of poles in independent pole scaffolds. The free ends of pole scaffolds shall be cross braced.

(10) Full diagonal face bracing shall be erected across the entire face of pole scaffolds in both directions. The braces shall be spliced at the poles.

(11) Platform planks shall be laid with their edges close together so the platform will be tight with no spaces through which tools or fragments of material can fall.

(12) Where planking is lapped, each plank shall lap its end supports at least 12 inches. Where the ends of planks abut each other to from a flush floor, the butt joint shall be at the centerline of a pole. The abutted ends shall rest on separate bearers. Intermediate beams shall be provided where necessary to prevent dislodgment of planks due to deflection, and the ends shall be nailed or cleated to prevent their dislodgment.

(13) When a scaffold turns a corner, the platform planks shall be laid to prevent tipping. The planks that meet the corner putlog at an angle shall be laid first, extending over the diagonally placed putlog far enough to have a good safe bearing, but not far enough to involve any danger from tipping. The planking running in the opposite direction at right angles shall be laid so as to extend over and rest on the first layer of planking.

(14) When moving platforms to the next level, the old platform shall be left undisturbed until the new putlogs or bearers have been set in place, ready to receive the platform planks.

(15) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1 x 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(16) All wood pole scaffolds 60 feet or less in height shall be constructed and erected in accordance with tables D–7 through D–12 of this section. If they are over 60 feet in height they shall be designed by a registered professional engineer and constructed and erected in accordance with such design. A copy of the typical drawings and specifications shall be made available to the employer and for inspection purposes.

TABLE D-7—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS LIGHT DUTY

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in.	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.	5 ft. 0 in.
Bearers or putlogs to 3 ft. 0 in. width	2 by 4 in.	2 by 4 in.
Bearers or putlogs to 5 ft. 0 in. width	2 by 6 in. or 3 by 4 in.	2 by 6 in. or 3 by 4 in. (rough).
Ledgers	1 by 4 in.	1¼ by 9 in.
Planking	1¼ by 9 in. (rough)	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in.	1 by 4 in.
Tie-ins	1 by 4 in.	1 by 4 in.
Toeboards	4 in. high (minimum)	4 in. high (minimum).
Guardrail	2 by 4 in.	2 by 4 in.

All members except planking are used on edge.

(17) Wood-pole scaffolds shall not be erected beyond the reach of effective firefighting apparatus.

TABLE D-8—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS

MEDIUM DUTY

Uniformly distributed load.	Not to exceed 50 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	8 ft. 0 in.
Maximum width of scaffold.	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 4 in.
Spacing of bearers or putlogs.	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	9 ft. 0 in.
Bracing, horizontal	1 by 6 in. or 1¼ by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-9—MIMIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE POLE SCAFFOLDS

HEAVY DUTY

Uniformly distributed load.	Not to exceed 75 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	6 ft. 0 in.
Maximum width of scaffold.	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 5 in. (rough).
Spacing of bearers or putlogs.	6 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	6 ft. 6 in.
Bracing, horizontal and diagonal.	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-10—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS LIGHT DUTY

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in.	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Pole spacing (transverse)	6 ft. 0 in.	10 ft. 0 in.
Ledgers	1¼ by 4 in.	1¼ by 9 in.
Bearers to 3 ft. 0 in. span	2 by 4 in.	2 by 4 in.
Bearers to 10 ft. 0 in. span	2 by 6 in. or 3 by 4 in.	2 by 9 (rough) or 3 by 8 in.
Planking	1¼ by 9 in.	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in.	1 by 4 in.
Tie-ins	1 by 4 in.	1 by 4 in.
Toeboards	4 in. high	4 in. high (minimum).
Guardrail	2 by 4 in.	2 by 4 in.

All members except planking are used on edge.

TABLE D-11—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS

MEDIUM DUTY

Uniformly distributed load.	Not to exceed 50 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	8 ft. 0 in.
Pole spacing (transverse).	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	6 ft. 0 in.
Spacing of bearers	8 ft. 0 in.
Bearers	2 by 9 in. (rough) or 2 by 10 in.
Bracing, horizontal	1 by 6 in. or 1¼ by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-12—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT POLE SCAFFOLDS

HEAVY DUTY

Uniformly distributed load.	Not to exceed 75 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	6 ft. 0 in.
Pole spacing (transverse).	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	4 ft. 6 in.
Bearers	2 by 9 in. (rough).
Bracing, horizontal and diagonal.	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

All members except planking are used on edge.

TABLE D-13—TUBE AND COUPLER SCAFFOLDS LIGHT DUTY

Uniformly distributed load	Not to exceed 25 p.s.f.
Post spacing (longitudinal)	10 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	8	125 ft.
2	4	125 ft.
3	0	91 ft. 0 in.

TABLE D-14—TUBE AND COUPLER SCAFFOLDS MEDIUM DUTY

Uniformly distributed load	Not to exceed 50 p.s.f.
Post spacing (longitudinal)	8 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.
2	0	78 ft. 0 in.

TABLE D-15—TUBE AND COUPLER SCAFFOLDS HEAVY DUTY

Uniformly distributed load	Not to exceed 75 p.s.f.
Post spacing (longitudinal)	6 ft. 6 in.
Post spacing (traverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.

(c) *Tube and coupler scaffolds*. (1) A light-duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal 2-inch O.D. steel tubing. The posts shall be spaced no more than 6 feet apart by 10 feet along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load.

(2) A medium-duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing. Posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2½-inch O.D. steel tubing. Posts spaced not more than 5 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2-inch O.D. steel tubing. Other structural metals when used must be designed to carry an equivalent load.

(3) A heavy-duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing, with the posts spaced not more than 6 feet apart by 6 feet 6 inches along the length of the scaffold. Other structural metals when used must be designed to carry an equivalent load.

(4) Tube and coupler scaffolds shall be limited in heights and working levels to those permitted in tables D-13, 14, and 15, of this section. Drawings and specifications of all tube and coupler scaffolds above the limitations in tables D-13, 14, and 15 of this section shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.

(5) All tube and coupler scaffolds shall be constructed and erected to support four times the maximum intended loads as set forth in tables D-13, 14, and 15 of this section, or as set forth in the specifications by a registered professional engineer, copies which shall be made available to the employer and for inspection purposes.

(6) All tube and coupler scaffolds shall be erected by competent and experienced personnel.

(7) Posts shall be accurately spaced, erected on suitable bases, and maintained plumb.

(8) Runners shall be erected along the length of the scaffold located on both the inside and the outside posts at even height. Runners shall be interlocked to form continuous lengths and coupled to each post. The bottom runners shall be located as close to the base as possible. Runners shall be placed not more than 6 feet 6 inches on centers.

(9) Bearers shall be installed transversely between posts and shall be securely coupled to the posts bearing on the runner coupler. When coupled directly to the runners, the coupler must be kept as close to the posts as possible.

(10) Bearers shall be at least 4 inches but not more than 12 inches longer than the post spacing or runner spacing. Bearers may be cantilevered for use as brackets to carry not more than two planks.

(11) Cross bracing shall be installed across the width of the scaffold at least every third set of posts horizontally and every fourth runner vertically. Such bracing shall extend diagonally from the inner and outer runners upward to the next outer and inner runners.

(12) Longitudinal diagonal bracing shall be installed at approximately a 45-degree angle from near the base of the first outer post upward to the extreme top of the scaffold. Where the longitudinal length of the scaffold permits, such bracing shall be duplicated beginning at every fifth post. In a similar manner, longitudinal diagonal bracing shall also be installed from the last post extending back and upward toward the first post. Where conditions preclude the attachment of this bracing to the posts, it may be attached to the runners.

(13) The entire scaffold shall be tied to and securely braced against the building at intervals not to exceed 30 feet horizontally and 26 feet vertically.

(14) Guardrails not less than 2×4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1×4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(d) *Tubular welded frame scaffolds.* (1) Metal tubular frame scaffolds, including accessories such as braces, brackets, trusses, screw legs, ladders, etc., shall be designed and proved to safely support four times the maximum intended load.

(2) Spacing of panels or frames shall be consistent with the loads imposed.

(3) Scaffolds shall be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.

(4) Scaffold legs shall be set on adjustable bases or plain bases placed on mud sills or other foundations adequate to support the maximum intended load.

(5) The frames shall be placed one on top of the other with coupling or stacking pins to provide proper vertical alinement of the legs.

(6) Where uplift may occur, panels shall be locked together vertically by pins or other equivalent suitable means.

(7) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- x 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(8) All tubular metal scaffolds shall be constructed and erected to support four times the maximum intended loads.

(9) To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet horizontally and 26 feet vertically.

(10) Maximum permissible spans of planking shall be in conformity with paragraph (a)(9) of this section.

(11) Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.

(12) All tubular welded frame scaffolds shall be erected by competent and experienced personnel.

(13) Frames and accessories for scaffolds shall be maintained in good repair and every defect, unsafe condition, or noncompliance with this section shall be immediately corrected before further use of the scaffold. Any broken, bent, excessively rusted, altered, or otherwise structurally damaged frames or accessories shall not be used.

(14) Periodic inspections shall be made of all welded frames and accessories, and any maintenance, including painting, or minor corrections authorized by the manufacturer, shall be made before further use.

(e) *Outrigger scaffolds.* (1) Outrigger beams shall extend not more than 6 feet beyond the face of the building. The inboard end of outrigger beams, measured from the fulcrum point to the extreme point of support, shall be not less than one and one-half times the outboard end in length. The beams shall rest on edge, the sides shall be plumb, and the edges shall be horizontal. The fulcrum point of the beam shall rest on a secure bearing at least 6 inches in each horizontal dimension. The beam shall be secured in place against movement and shall be securely braced at the fulcrum point against tipping.

(2) The inboard ends of outrigger beams shall be securely supported either by means of struts bearing against sills in contact with the overhead beams or ceiling, or by means of tension members secured to the floor joists underfoot, or by both if necessary. The inboard ends of outrigger beams shall be secured against tipping and the entire supporting structure shall be securely braced in both directions to prevent any horizontal movement.

(3) Unless outrigger scaffolds are designed by a licensed professional engineer, they shall be constructed and erected in accordance with table D-16. Outrigger scaffolds designed by a registered professional engineer shall be constructed and erected in accordance with such design. A copy of the detailed drawings and specifications showing the sizes and spacing of members shall be kept on the job.

(4) Planking shall be laid tight and shall extend to within 3 inches of the building wall. Planking shall be nailed or bolted to outriggers.

(5) Where there is danger of material falling from the scaffold, a wire mesh or other enclosure shall be provided between the guardrail and the toeboard.

(6) Where additional working levels are required to be supported by the outrigger method, the plans and specifications of the outrigger and scaffolding structure shall be designed by a registered professional engineer.

TABLE D-16—MINIMUM NOMINAL SIZE AND MAXIMUM SPACING OF MEMBERS OF OUTRIGGER SCAFFOLDS

	Light duty	Medium duty
Maximum scaffold load	25 p.s.f.	50 p.s.f.
Outrigger size	2 x 10 in.	3 x 10 in.
Maximum outrigger spacing.	10 ft 0 in.	6 ft 0 in.
Planking	2 x 9 in.	2 x 9 in.
Guardrail	2 x 4 in.	2 x 4 in.
Guardrail uprights	2 x 4 in.	2 x 4 in.
Toeboards	4 in. (minimum).	4 in. (minimum).

(f) *Masons' adjustable multiple-point suspension scaffolds*. (1) The scaffold shall be capable of sustaining a working load of 50 pounds per square foot and shall not be loaded in excess of that figure.

(2) The scaffold shall be provided with hoisting machines that meet the requirements of Underwriters' Laboratories or Factory Mutual Engineering Corp.

(3) The platform shall be supported by wire ropes in conformity with paragraph (a) (22) of this section, suspended from overhead outrigger beams.

(4) The scaffold outrigger beams shall consist of structural metal securely fastened or anchored to the frame or floor system of the building or structure.

(5) Each outrigger beam shall be equivalent in strength to at least a standard 7-inch, 15.3-pound steel I-beam, be at least 15 feet long, and shall not project more than 6 feet 6 inches beyond the bearing point.

(6) Where the overhang exceeds 6 feet 6 inches, outrigger beams shall be composed of stronger beams or multiple beams and be installed in accordance with approved designs and instructions.

(7) If channel iron outrigger beams are used in place of I-beams, they shall be securely fastened together with the flanges turned out.

(8) All outrigger beams shall be set and maintained with their webs into vertical position.

(9) A stop bolt shall be placed at each end of every outrigger beam.

(10) The outrigger beam shall rest on suitable wood-bearing blocks.

(11) All parts of the scaffold such as bolts, nuts, fittings, clamps, wire rope, and outrigger beams and their fastenings, shall be maintained in sound and good working condition and shall be inspected before each installation and periodically thereafter.

(12) The free end of the suspension wire ropes shall be equipped with proper size thimbles and be secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four turns of rope shall at all times remain on the drum.

(13) Where a single outrigger beam is used, the steel shackles or clevises with which the wire ropes are attached to the outrigger beams shall be placed directly over the hoisting drums.

(14) The scaffold platform shall be equivalent in strength to at least 2-inch planking. (For maximum planking spans see paragraph (a) (9) of this section.)

(15) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1 x 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a) (17) of this section.

(16) Overhead protection shall be provided on the scaffold, not more than 9 feet above the platform, consisting of 2-inch planking or material of equivalent strength laid tight, when men are at work on the scaffold and an overhead hazard exists.

(17) Each scaffold shall be installed or relocated in accordance with designs and instructions, of a registered professional engineer, and supervised by a competent, designated person.

(g) *Two-point suspension scaffolds (swinging scaffolds)*. (1) Two-point suspension scaffold platforms shall be not less than 20 inches nor more than 36 inches wide overall. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.

(2) The hangers of two-point suspension scaffolds shall be made of wrought iron, mild steel, or other equivalent material having a cross-sectional area capable of sustaining four times the maximum intended load, and shall be designed with a support for guardrail, intermediate rail, and toeboard.

(3) When hoisting machines are used on two-point suspension scaffolds, such machines shall be of a design tested and approved by Underwriters' Laboratories or Factory Mutual Engineering Corp.

(4) The roof irons or hooks shall be of wrought iron, mild steel, or other equivalent material of proper size and design, securely installed and anchored. Tiebacks of three-fourth inch manila rope or the equivalent shall serve as a secondary means of anchorage, installed at right angles to the face of the building whenever possible and secured to a structurally sound portion of the building.

(5) Guardrails not less than 2 x 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- x 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a) (17) of this section.

(6) Two-point suspension scaffolds shall be suspended by wire or fiber ropes. Wire and fiber ropes shall conform to paragraph (a) (22) of this section.

(7) The blocks for fiber ropes shall be of standard 6-inch size, consisting of at least one double and one single block. The sheaves of all blocks shall fit the size of rope used.

(8) All wire ropes, fiber ropes, slings, hangers, platforms, and other supporting parts shall be inspected before every installation. Periodic inspections shall be made while the scaffold is in use.

(9) On suspension scaffolds designed for a working load of 500 pounds no more than two men shall be permitted to work at one time. On suspension scaffolds with a working load of 750 pounds, no more than three men shall be permitted to work at one time. Each workman shall be protected by a safety lifebelt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

(10) Where acid solutions are used, fiber ropes are not permitted unless acid-proof.

(11) Two-point suspension scaffolds shall be securely lashed to the building or structure to prevent them from swaying. Window cleaners' anchors shall not be used for this purpose.

(12) The platform of every two-point suspension scaffold shall be one of the following types:

(i) The side stringer of ladder-type platforms shall be clear straight-grained spruce or materials of equivalent strength and durability. The rungs shall be of straight-grained oak, ash, or hickory, at least 1⅛ inch in diameter, with seven-eighth inch tenons mortised into the side stringers at least seven-eighth inch. The stringers shall be tied together with the tie rods not less than one-quarter inch in diameter, passing through the stringers and riveted up tight against washers on both ends. The flooring strips shall be spaced not more than five-eighth inch apart except at the side rails where the space may be 1 inch. Ladder-type platforms shall be constructed in accordance with table D-17.

(ii) Plank-type platforms shall be composed of not less than nominal 2- x 8-inch unspliced planks, properly cleated together on the underside starting 6 inches from each end; intervals in between shall not exceed 4 feet. The plank-type platform shall not extend beyond the hangers more than 18 inches. A bar or other effective means shall be securely fastened to the platform at each end to prevent its slipping off the hanger. The span between hangers for plank-type platforms shall not exceed 10 feet.

(iii) Beam platforms shall have side stringers of lumber not less than 2 x 6 inches set on edge. The span between hangers shall not exceed 12 feet when beam platforms are used. The flooring shall be supported on 2- and 6-inch crossbeams, laid flat and set into the upper edge of the stringers with a snug fit, at intervals of not more than 4 feet, securely nailed in place. The flooring shall be of 1- x 6-inch material properly nailed. Floorboards shall not be spaced more than one-half inch apart.

TABLE D-17—SCHEDULE FOR LADDER-TYPE PLATFORMS

	Length of platform (feet)				
	12	14 & 16	18 & 20	22 & 24	28 & 30
Side stringers, minimum cross section (finished sizes):					
At ends (in.)	1¾ x 2¾	1¾ x 2¾	1¾ x 3	1¾ x 3	1¾ x 3½
At middle (in.)	1¾ x 3¾	1¾ x 3¾	1¾ x 4	1¾ x 4¼	1¾ x 5
Reinforcing strip (minimum)	A ⅛x⅞-in. steel reinforcing strip or its equivalent shall be attached to the side or underside full length.				
Rungs	Rungs shall be 1⅛-in. minimum, diameter with at least ⅞-in. diameter tenons, and the maximum spacing shall be 12 in. center to center.				
Tie rods:					
Number (minimum)	3	4	4	5	6
Diameter (minimum)	¼ in.	¼ in.	¼ in.	¼ in.	¼ in.
Flooring, minimum finished size (in.)	½ x 2¾	½ x 2¾	½ x 2¾	½ x 2¾	½ x 2¾

(h) *Stone setters' adjustable multiple-point suspension scaffolds.* (1) The scaffold shall be capable of sustaining a working load of 25 pounds per square foot and shall not be overloaded. Scaffolds shall not be used for storage of stone or other heavy materials.

(2) The hoisting machine and its supports shall be of a type tested and listed by Underwriters' Laboratories or Factory Mutual Engineering Corp.

(3) The platform shall be securely fastened to the hangers by U-bolts or other equivalent means.

(4) The scaffold unit shall be suspended from metal outriggers, iron brackets, wire rope slings, or iron hooks which will safely support the maximum intended load.

(5) Outriggers when used shall be set with their webs in a vertical position, securely anchored to the building or structure and provided with stop bolts at each end.

(6) The scaffold shall be supported by wire rope conforming with paragraph (a)(22) of this section, suspended from overhead supports.

(7) The free ends of the suspension wire ropes shall be equipped with proper size thimbles, secured by splicing or other equivalent means. The running ends shall be securely attached to the hoisting drum and at least four turns of rope shall remain on the drum at all times.

(8) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(9) When two or more scaffolds are used on a building or structure they shall not be bridged one to the other but shall be maintained at even height with platforms butting closely.

(10) Each scaffold shall be installed or relocated in accordance with designs and instructions of a registered professional engineer, and such installation or relocation shall be supervised by a competent designated person.

(i) *Single-point adjustable suspension scaffolds.* (1) The scaffolding, including power units or manually operated winches, shall be of a type tested and listed by Underwriters' Laboratories or Factory Mutual Engineering Corp.

(2) The power units may be either electrically or air motor driven.

(3) All power-operated gears and brakes shall be enclosed.

(4) In addition to the normal operating brake, all-power driven units must have an emergency brake which engages automatically when the normal speed of descent is exceeded.

(5) Guards, mid-rails, and toeboards shall completely enclose the cage or basket. Guardrails shall be no less than 2 by 4 inches or the equivalent installed no less than 36 inches nor more than 42 inches above the platform. Mid-rails shall be 1 by 6 inches or the equivalent, installed equidistant between the guardrail and the platform. Toeboards shall be a minimum of 4 inches in height.

(6) The hoisting machines, cables, and equipment shall be regularly serviced and inspected after each installation and every 30 days thereafter.

(7) The units may be combined to form a two-point suspension scaffold. Such scaffold shall comply with paragraph (g) of this section.

(8) The supporting cable shall be straight for its entire length, and the operator shall not sway the basket and fix the cable to any intermediate points to change his original path of travel.

(9) Equipment shall be maintained and used in accordance with the manufacturers' instructions.

(10) Suspension methods shall conform to applicable provisions of paragraphs (f) and (g) of this section.

(j) *Boatswain's chairs.* (1) The chair seat shall be not less than 12 by 24 inches, and of 1-inch thickness. The seat shall be reinforced on the underside to prevent the board from splitting.

(2) The two fiber rope seat slings shall be of ⅝-inch diameter, reeved through the four seat holes so as to cross each other on the underside of the seat.

(3) Seat slings shall be of at least ⅜-inch wire rope when a workman is conducting a heat producing process such as gas or arc welding.

(4) The workman shall be protected by a safety life belt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the worker in case of a fall.

(5) The tackle shall consist of correct size ball bearing or bushed blocks and properly spliced ⅝-inch diameter first-grade manila rope.

(6) The roof irons, hooks, or the object to which the tackle is anchored shall be securely installed. Tiebacks when used shall be installed at right angles to the face of the building and securely fastened to a chimney.

(k) *Carpenters' bracket scaffolds.* (1) The brackets shall consist of a triangular wood frame not less than 2 by 3 inches in cross section, or of metal of equivalent strength. Each member shall be properly fitted and securely joined.

(2) Each bracket shall be attached to the structure by means of one of the following:

(i) A bolt no less than five-eighths inch in diameter which shall extend through the inside of the building wall.

(ii) A metal stud attachment device.

(iii) Welding to steel tanks.

(iv) Hooking over a well-secured and adequately strong supporting member.

The brackets shall be spaced no more than 10 feet apart.

(3) No more than two persons shall occupy any given 10 feet of a bracket scaffold at any one time. Tools and materials shall not exceed 75 pounds in addition to the occupancy.

(4) The platform shall consist of not less than two 2- by 9-inch nominal size planks extending not more than 18 inches or less than 6 inches beyond each end support.

(5) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(l) *Bricklayers' square scaffolds.* (1) The squares shall not exceed 5 feet in width and 5 feet in height.

(2) Members shall be not less than those specified in Table D-18.

(3) The squares shall be reinforced on both sides of each corner with 1- by 6-inch gusset pieces. They shall also have braces 1 by 8 inches on both sides running from center to center of each member, or other means to secure equivalent strength and rigidity.

(4) The squares shall be set not more than 5 feet apart for medium duty scaffolds, and not more than 8 feet apart for light duty scaffolds. Bracing 1 x 8 inches, extending from the bottom of each square to the top of the next square, shall be provided on both front and rear sides of the scaffold.

TABLE D-18—MINIMUM DIMENSIONS FOR BRICKLAYERS' SQUARE SCAFFOLD MEMBERS

Members:	*Dimensions (inches)*
Bearers or horizontal members	2 by 6.
Legs	2 by 6.
Braces at corners	1 by 6.
Braces diagonally from center frame	1 by 8.

(5) Platform planks shall be at least 2- by 9-inch nominal size. The ends of the planks shall overlap the bearers of the squares and each plank shall be supported by not less than three squares.

(6) Bricklayers' square scaffolds shall not exceed three tiers in height and shall be so constructed and arranged that one square shall rest directly above the other. The upper tiers shall stand on a continuous row of planks laid across the next lower tier and be nailed down or otherwise secured to prevent displacement.

(7) Scaffolds shall be level and set upon a firm foundation.

(m) *Horse scaffolds.*

(1) Horse scaffolds shall not be constructed or arranged more than two tiers or 10 feet in height.

(2) The members of the horses shall be not less than those specified in Table D-19.

(3) Horses shall be spaced not more than 5 feet for medium duty and not more than 8 feet for light duty.

(4) When arranged in tiers, each horse shall be placed directly over the horse in the tier below.

(5) On all scaffolds arranged in tiers, the legs shall be nailed down to the planks to prevent displacement or thrust and each tier shall be substantially cross braced.

TABLE D-19—MINIMUM DIMENSIONS FOR HORSE SCAFFOLD MEMBERS

Members:	*Dimensions (inches)*
Horizontal members or bearers	3 by 4.
Legs	1¼ by 4½.
Longitudinal brace between legs	1 by 6.
Gusset brace at top of legs	1 by 8.
Half diagonal braces	1¼ by 4½.

(6) Horses or parts which have become weak or defective shall not be used.

(7) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high with a mid-rail, when required, of 1- by 4-inch lumber or equivalent and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(n) *Needle beam scaffold.* (1) Wood needle beams shall be in accordance with paragraph (a) (5) and (9) of this section, and shall be not less than 4 by 6 inches in size, with the greater dimension placed in a vertical direction. Metal beams or the equivalent conforming to paragraph (a) (4) and (8) of this section may be used.

(2) Ropes or hangers shall be provided for supports. The span between supports on the needle beam shall not exceed 10 feet for 4- by 6-inch timbers. Rope supports shall be equivalent in strength to 1-inch diameter first-grade manila rope.

(3) The ropes shall be attached to the needle beams by a scaffold hitch or a properly made eye splice. The loose end of the rope shall be tied by a bowline knot or by a round turn and one-half hitch.

(4) The platform span between the needle beams shall not exceed 8 feet when using 2-inch scaffold plank. For spans greater than 8 feet, platforms shall be designed based on design requirements for the special span. The overhang of each end of the platform planks shall be not less than 1 foot and not more than 18 inches.

(5) When one needle beam is higher than the other or when the platform is not level the platform shall be secured against slipping.

(6) All unattached tools, bolts, and nuts used on needle beam scaffolds shall be kept in suitable containers.

(7) One end of a needle beam scaffold may be supported by a permanent structural member conforming to paragraph (a) (4) and (8) of this section.

(8) Each man working on a needle beam scaffold 20 feet or more above the ground or floor and working with both hands, shall be protected by a safety life belt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

(o) *Plasterers', decorators', and large area scaffolds.* (1) Plasterers', decorators', lathers', and ceiling workers' inside scaffolds shall be constructed in accordance with the general requirements set forth for independent wood pole scaffolds.

(2) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(3) All platform planks shall be laid with the edges close together.

(4) When independent pole scaffold platforms are erected in sections, such sections shall be provided with connecting runways equipped with substantial guardrails.

(p) *Interior hung scaffolds.* (1) An interior hung scaffold should be hung or suspended from the roof structure or substantial ceiling beams.

(2) The suspended steel wire rope shall conform to paragraph (a)(22) of this section. Wire may be used providing the strength requirements of paragraph (a)(22) of this section are met.

(3) For hanging wood scaffolds, the following minimum nominal size material is recommended:

(i) Supporting bearers 2 by 9 inches on edge.

(ii) Planking 2 by 9 inches or 2 by 10 inches, with maximum span 7 feet for heavy duty and 10 feet for light duty or medium duty.

(4) Steel tube and coupler members may be used for hanging scaffolds with both types of scaffold designed to sustain a uniform distributed working load up to heavy duty scaffold loads with a safety factor of four.

(5) When a hanging scaffold is supported by means of wire rope, such wire rope shall be wrapped at least twice around the supporting members and twice around the bearers of the scaffold, with each end of the wire rope secured by at least three standard wire-rope clips.

(6) All overhead supporting members shall be inspected and checked for strength before the scaffold is erected.

(7) Guardrails not less than 2 by 4 inches or the equivalent and not less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch lumber or equivalent, and toeboards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toeboards shall be a minimum of 4 inches in height. Wire mesh shall be installed in accordance with paragraph (a)(17) of this section.

(q) *Ladder-jack scaffolds.* (1) All ladder-jack scaffolds shall be limited to light duty and shall not exceed a height of 20 feet above the floor or ground.

(2) All ladders used in connection with ladder-jack scaffolds shall be heavy-duty ladders and shall be designed and constructed in accordance with § 1910.25 and § 1910.26.

(3) The ladder jack shall be so designed and constructed that it will bear on the side rails in addition to the ladder rungs, or if bearing on rungs only, the bearing area shall be at least 10 inches on each rung.

(4) Ladders used in conjunction with ladder jacks shall be so placed, fastened, held, or equipped with devices so as to prevent slipping.

(5) The wood platform planks shall be not less than 2 inches nominal in thickness. Both metal and wood platform planks shall overlap the bearing surface not less than 12 inches. The span between supports for wood shall not exceed 8 feet. Platform width shall be not less than 18 inches.

(6) Not more than two persons shall occupy any given 8 feet of any ladder-jack scaffold at any one time.

(r) *Window-jack scaffolds.* (1) Window-jack scaffolds shall be used only for the purpose of working at the window opening through which the jack is placed.

(2) Window jacks shall not be used to support planks placed between one window jack and another or for other elements of scaffolding.

(3) Window-jack scaffolds shall be provided with suitable guardrails unless safety belts with lifelines are attached and provided for the workman. Window-jack scaffolds shall be used by one man only.

(s) *Roofing brackets.* (1) Roofing brackets shall be constructed to fit the pitch of the roof.

(2) Brackets shall be secured in place by nailing in addition to the pointed

metal projections. The nails shall be driven full length into the roof. When rope supports are used, they shall consist of first-grade manila of at least three-quarter-inch diameter, or equivalent.

(3) A substantial catch platform shall be installed below the working area of roofs more than 20 feet from the ground to eaves with a slope greater than 3 inches in 12 inches without a parapet. In width the platform shall extend 2 feet beyond the projection of the eaves and shall be provided with a safety rail, mid-rail, and toeboard. This provision shall not apply where employees engaged in work upon such roofs are protected by a safety belt attached to a lifeline.

(t) *Crawling boards or chicken ladders.* (1) Crawling boards shall be not less than 10 inches wide and 1 inch thick, having cleats 1 x 1½ inches. The cleats shall be equal in length to the width of the board and spaced at equal intervals not to exceed 24 inches. Nails shall be driven through and clinched on the underside. The crawling board shall extend from the ridge pole to the eaves when used in connection with roof construction, repair, or maintenance.

(2) A firmly fastened lifeline of at least three-quarter-inch rope shall be strung beside each crawling board for a handhold.

(3) Crawling boards shall be secured to the roof by means of adequate ridge hooks or equivalent effective means.

(u) *Float or ship scaffolds.* (1) Float or ship scaffolds shall support not more than three men and a few light tools, such as those needed for riveting, bolting, and welding. They shall be constructed in accordance with subparagraphs (2) through (6) of this paragraph, unless substitute designs and materials provide equivalent strength, stability, and safety.

(2) The platform shall be not less than 3 feet wide and 6 feet long, made of three-quarter-inch plywood, equivalent to American Plywood Association Grade B-B, Group I, Exterior.

(3) Under the platform, there shall be two supporting bearers made from 2- x 4-inch, or 1- x 10-inch rough, selected lumber, or better. They shall be free of knots or other flaws and project 6 inches beyond the platform on both sides. The ends of the platform shall extend about 6 inches beyond the outer edges of the bearers. Each bearer shall be securely fastened to the platform.

(4) An edging of wood not less than ¾ x 1½ inches, or equivalent, shall be placed around all sides of the platform to prevent tools from rolling off.

(5) Supporting ropes shall be 1-inch diameter manila rope or equivalent, free from deterioration, chemical damage, flaws, or other imperfections. Rope connections shall be such that the platform cannot shift or slip. If two ropes are used with each float, they should be arranged so as to provide four ends which are to be securely fastened to an overhead support. Each of the two supporting ropes shall be hitched around one end of a bearer and pass under the platforms to the other end of the bearer where it is hitched again, leaving sufficient rope at each end for the supporting ties.

(6) Each workman shall be protected by a safety lifebelt attached to a lifeline. The lifeline shall be securely attached to substantial members of the structure (not scaffold), or to securely rigged lines, which will safely suspend the workman in case of a fall.

(v) *Scope.* This section establishes safety requirements for the construction, operation, maintenance, and use of scaffolds used in the construction, alteration, demolition, and maintenance of buildings and structures.

§ 1910.29 Manually propelled mobile ladder stands and scaffolds (towers).

(a) *General requirements*—(1) *Application.* This section is intended to prescribe rules and requirements for the design, construction, and use of mobile work platforms (including ladder stands but not including aerial ladders) and rolling (mobile) scaffolds (towers). This standard is promulgated to aid in providing for the safety of life, limb, and property, by establishing minimum standards for structural design requirements and for the use of mobile work platforms and towers.

(2) *Working loads.* (i) Work platforms and scaffolds shall be capable of carrying the design load under varying circumstances depending upon the conditions of use. Therefore, all parts and appurtances necessary for their safe and efficient utilization must be integral parts of the design.

(ii) Specific design and construction requirements are not a part of this section because of the wide variety of materials and design possibilities. However, the design shall be such as to produce a mobile ladder stand or scaffold that will safely sustain the specified loads. The material selected shall be of sufficient strength to meet the test requirements and shall be protected against corrosion or deterioration.

(*a*) The design working load of ladder stands shall be calculated on the basis of one or more 200-pound persons together with 50 pounds of equipment each.

(*b*) The design load of all scaffolds shall be calculated on the basis of:

Light—Designed and constructed to carry a working load of 25 pounds per square foot.

Medium—Designed and constructed to carry a working load of 50 pounds per square foot.

Heavy—Designed and constructed to carry a working load of 75 pounds per square foot.

All ladder stands and scaffolds shall be capable of supporting at least four times the design working load.

(iii) The materials used in mobile ladder stands and scaffolds shall be of standard manufacture and conform to standard specifications of strength, dimensions, and weights, and shall be selected to safely support the design working load.

(iv) Nails, bolts, or other fasteners used in the construction of ladders, scaffolds, and towers shall be of adequate size and in sufficient numbers at each connection to develop the designed strength of the unit. Nails shall be driven full length. (All nails should be immediately withdrawn from dismantled lumber.)

(v) All exposed surfaces shall be free from sharp edges, burrs or other safety hazards.

(3) *Work levels.* (i) The maximum work level height shall not exceed four (4) times the minimum or least base dimension of any mobile ladder stand or scaffold. Where the basic mobile unit does not meet this requirement, suitable outrigger frames shall be employed to achieve this least base dimension, or provisions shall be made to guy or brace the unit against tipping.

(ii) The minimum platform width for any work level shall not be less than 20 inches for mobile scaffolds (towers). Ladder stands shall have a minimum step width of 16 inches.

(iii) The supporting structure for the work level shall be rigidly braced, using adequate cross bracing or diagonal bracing with rigid platforms at each work level.

(iv) The steps of ladder stands shall be fabricated from slip resistant treads.

(v) The work level platform of scaffolds (towers) shall be of wood, aluminum, or plywood planking, steel or expanded metal, for the full width of the scaffold, except for necessary openings. Work platforms shall be secured in place. All planking shall be 2-inch (nominal) scaffold grade minimum 1,500 *f.* (stress grade) construction grade lumber or equivalent.

(vi) All scaffold work levels 10 feet or higher above the ground or floor shall have a standard (4-inch nominal) toeboard.

(vii) All work levels 10 feet or higher above the ground or floor shall have a guardrail of 2- by 4-inch nominal or the equivalent installed no less than 36 inches or more than 42 inches high, with a mid-rail, when required, of 1- by 4-inch nominal lumber or equivalent.

(viii) A climbing ladder or stairway shall be provided for proper access and egress, and shall be affixed or built into the scaffold and so located that its use will not have a tendency to tip the scaffold. A landing platform shall be provided at intervals not to exceed 30 feet.

(4) *Wheels or casters.* (i) Wheels or casters shall be properly designed for strength and dimensions to support four (4) times the design working load.

(ii) All scaffold casters shall be provided with a positive wheel and/or swivel lock to prevent movement. Ladder stands shall have at least two (2) of the four (4) casters and shall be of the swivel type.

(iii) Where leveling of the elevated work platform is required, screw jacks or other suitable means for adjusting the height shall be provided in the base section of each mobile unit.

(b) *Mobile tubular welded frame scaffolds*—(1) *General.* Units shall be designed to comply with the requirements of paragraph (a) of this section.

(2) *Bracing.* Scaffolds shall be properly braced by cross braces and/or diagonal braces for securing vertical members

together laterally. The cross braces shall be of a length that will automatically square and align vertical members so the erected scaffold is always plumb, square, and rigid.

(3) *Spacing*. Spacing of panels or frames shall be consistent with the loads imposed. The frames shall be placed one on top of the other with coupling or stacking pins to provide proper vertical alignment of the legs.

(4) *Locking*. Where uplift may occur, panels shall be locked together vertically by pins or other equivalent means.

(5) *Erection*. Only the manufacturer of a scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a registered professional engineer, or erected in accordance with instructions furnished by the manufacturer.

(c) *Mobile tubular welded sectional folding scaffolds*—(1) *General*. Units including sectional stairway and sectional ladder scaffolds shall be designed to comply with the requirements of paragraph (a) of this section.

(2) *Stairway*. An integral stairway and work platform shall be incorporated into the structure of each sectional folding stairway scaffold.

(3) *Bracing*. An integral set of pivoting and hinged folding diagonal and horizontal braces and a detachable work platform shall be incorporated into the structure of each sectional folding ladder scaffold.

(4) *Sectional folding stairway scaffolds*. Sectional folding stairway scaffolds shall be designed as medium duty scaffolds except for high clearance. These special base sections shall be designed as light duty scaffolds. When upper sectional folding stairway scaffolds are used with a special high clearance base, the load capacity of the entire scaffold shall be reduced accordingly. The width of a sectional folding stairway scaffold shall not exceed 4½ feet. The maximum length of a sectional folding stairway scaffold shall not exceed 6 feet.

(5) *Sectional folding ladder scaffolds*. Sectional folding ladder scaffolds shall be designed as light duty scaffolds including special base (open end) sections which are designed for high clearance. For certain special applications the six-foot (6′) folding ladder scaffolds, except for special high clearance base sections, shall be designed for use as medium duty scaffolds. The width of a sectional folding ladder scaffold shall not exceed 4½ feet. The maximum length of a sectional folding ladder scaffold shall not exceed 6 feet 6 inches for a six-foot (6′) long unit, 8 feet 6 inches for an eight-foot (8′) unit or 10 feet 6 inches for a ten-foot (10′) long unit.

(6) *End frames*. The end frames of sectional ladder and stairway scaffolds shall be designed so that the horizontal bearers provide supports for multiple planking levels.

(7) *Erection*. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.

(d) *Mobile tube and coupler scaffolds*—(1) *Design*. Units shall be designed to comply with the applicable requirements of paragraph (a) of this section.

(2) *Material*. The material used for the couplers shall be of a structural type, such as a drop-forged steel, malleable iron or structural grade aluminum. The use of gray cast iron is prohibited.

(3) *Erection*. Only the manufacturer of the scaffold or his qualified designated agent shall be permitted to erect or supervise the erection of scaffolds exceeding 50 feet in height above the base, unless such structure is approved in writing by a licensed professional engineer, or erected in accordance with instructions furnished by the manufacturer.

(e) *Mobile work platforms*—(1) *Design*. Units shall be designed for the use intended and shall comply with the requirements of paragraph (a) of this section.

(2) *Base width*. The minimum width of the base of mobile work platforms shall not be less than 20 inches.

(3) *Bracing*. Adequate rigid diagonal bracing to vertical members shall be provided.

(f) *Mobile ladder stands*.

(1) *Design*. Units shall comply with applicable requirements of paragraph (a) of this section.

(2) *Base width*. The minimum base width shall conform to paragraph (a)(3)(i) of this section. The maximum length of the base section shall be the total length of combined steps and top assembly, measured horizontally, plus five-eighths inch per step of rise.

(3) *Steps*. Steps shall be uniformly spaced, and sloped, with a rise of not less than nine (9) inches, nor more than ten (10) inches, and a depth of not less seven (7) inches. The slope of the steps section shall be a minimum of fifty-five (55) degrees and a maximum of sixty (60) degrees measured from the horizontal.

(4) *Handrails*. (i) Units having more than five (5) steps or 60 inches vertical height to the top step shall be equipped with handrails.

(ii) Handrails shall be a minimum of 29 inches high. Measurements shall be taken vertically from the center of the step.

(5) *Loading*. The load (see paragraph (a)(2)(ii)(*a*) of this section) shall be applied uniformly to a 3½ inches wide area front to back at the center of the width span with a safety factor of four (4).

§ 1910.30 Other working surfaces.

(a) *Dockboards (bridge plates)*. (1) Portable and powered dockboards shall be strong enough to carry the load imposed on them.

(2) Portable dockboards shall be secured in position, either by being anchored or equipped with devices which will prevent their slipping.

(3) Powered dockboards shall be designed and constructed in accordance with Commercial Standard CS202–56 (1961) "Industrial Lifts and Hinged Loading Ramps published by the U.S. Department of Commerce.

(4) Handholds, or other effective means, shall be provided on portable dockboards to permit safe handling.

(5) Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.

(b) *Forging machine area*. (1) Machines shall be so located as to give (i) enough clearance between machines so that the movement of one operator will not interfere with the work of another, (ii) ample room for cleaning machines and handling the work, including material and scrap. The arrangement of machines shall be such that operators will not stand in aisles.

(2) Aisles shall be provided of sufficient width to permit the free movement of employees bringing and removing material. This aisle space is to be independent of working and storage space and should be defined by marking.

(3) Wood platforms used on the floor in front of machines shall be substantially constructed.

(c) *Veneer machinery*. (1) Sides of steam vats shall extend to a height of not less than 36 inches above the floor, working platform, or ground.

(2) Large steam vats divided into sections shall be provided with substantial walkways between sections. Each walkway shall be provided with a standard handrail on each exposed side. These handrails may be removable, if necessary.

(3) Covers shall be removed only from that portion of steaming vats on which men are working and a portable railing shall be placed at this point to protect the operators.

(4) Workmen shall not ride or step on logs in steam vats.

§ 1910.31 Sources of standards.

The standards in this Subpart D are devised from the following sources:

Standard	*Source*
§ 1910.22(a)	ANSI Z4.1–1968, Requirements for Sanitation in Places of Employment.
§ 1910.22 (b) and (c).	41 CFR 50–204.3.
§ 1910.22(d)	ANSI A58.1–1955, Minimum Design Loads in Building and Other Structures.
§ 1910.23	ANSI A12.1–1967, Safety Requirements for Floor and Wall Openings, Railings, and Toeboards.
§ 1910.24	ANSI A64.1–1968, Requirements for Fixed Industrial Stairs.
§ 1910.25	ANSI A14.1–1968, Safety Code for Portable Wood Ladders.

Standard	*Source*
§ 1910.26 ----------	ANSI A14.2–1956, Portable Metal Ladders.
§ 1910.27 ----------	ANSI A14.3–1956, Safety Code for Fixed Ladders.
§ 1910.28 ----------	ANSI A10.8–1969, Safety Requirements for Scaffolding.
§ 1910.29 ----------	ANSI A92.1–1971, Standard for Manually Propelled Mobile Ladder Stands and Scaffolds.
§ 1910.30(a) ------	ANSI B56.1—1969, Safety Standard for Powered Industrial Trucks.
§ 1910.30(b) ------	ANSI B24.1–1963, Safety Standard for Forging.
§ 1910.30(c) ------	ANSI 01.1–1954, Safety Code for Woodworking Machinery.

§ 1910.32 Standards organizations.

The following organizations have been referenced in this Subpart D:

American National Standards Institute, 1430 Broadway, New York, NY 10018.

Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, IL 60611.

Factory Mutual Engineering Corp., Post Office Box 688, Norwood, MA 02062.

Subpart E—Means of Egress

§ 1910.35 Definitions.

As used in this subpart

(a) *Means of egress.* A means of egress is a continuous and unobstructed way of exit travel from any point in a building or structure to a public way and consists of three separate and distinct parts: the way of exit access, the exit, and the way of exit discharge. A means of egress comprises the vertical and horizontal ways of travel and shall include intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

(b) *Exit access.* Exit access is that portion of a means of egress which leads to an entrance to an exit.

(c) *Exit.* Exit is that portion of a means of egress which is separated from all other spaces of the building or structure by construction or equipment as required in this subpart to provide a protected way of travel to the exit discharge.

(d) *Exit discharge.* Exit discharge is that portion of a means of egress between the termination of an exit and a public way.

(e) *Low hazard contents.* Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur and that consequently the only probable danger requiring the use of emergency exits will be from panic, fumes, or smoke, or fire from some external source.

(f) *High-hazard contents.* High-hazard contents shall be classified as those which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of fire.

(g) *Ordinary hazard contents.* Ordinary hazard contents shall be classified as those which are liable to burn with moderate rapidity and to give off a considerable volume of smoke but from which neither poisonous fumes nor explosions are to be feared in case of fire.

(h) *Approved.* For the purposes of this subpart approved shall mean listed or approved equipment by a nationally recognized testing laboratory.

§ 1910.36 General requirements.

(a) *Application.* This subpart contains general fundamental requirements essential to providing a safe means of egress from fire and like emergencies. Nothing in this subpart shall be construed to prohibit a better type of building construction, more exits, or otherwise safer conditions than the minimum requirements specified in this subpart. Exits from vehicles, vessels, or other mobile structures are not covered by this subpart.

(b) *Fundamental requirements.* (1) Every building or structure, new or old, designed for human occupancy shall be provided with exits sufficient to permit the prompt escape of occupants in case of fire or other emergency. The design of exits and other safeguards shall be such that reliance for safety to life in case of fire or other emergency will not depend solely on any single safeguard; additional safeguards shall be provided for life safety in case any single safeguard is ineffective due to some human or mechanical failure.

(2) Every building or structure shall be so constructed, arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or structure in case of fire or other emergency.

(3) Every building or structure shall be provided with exits of kinds, numbers, location, and capacity appropriate to the individual building or structure, with due regard to the character of the occupancy, the number of persons exposed, the fire protection available, and the height and type of construction of the building or structure, to afford all occupants convenient facilities for escape.

(4) In every building or structure exits shall be so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied. No lock or fastening to prevent free escape from the inside of any building shall be installed except in mental, penal, or corrective institutions where supervisory personnel is continually on duty and effective provisions are made to remove occupants in case of fire or other emergency.

(5) Every exit shall be clearly visible or the route to reach it shall be conspicuously indicated in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point, and each path of escape, in its entirety, shall be so arranged or marked that the way to a place of safety outside is unmistakable. Any doorway or passageway not constituting an exit or way to reach an exit, but of such a character as to be subject to being mistaken for an exit, shall be so arranged or marked as to minimize its possible confusion with an exit and the resultant danger of persons endeavoring to escape from fire finding themselves trapped in a dead-end space, such as a cellar or storeroom, from which there is no other way out.

(6) In every building or structure equipped for artificial illumination, adequate and reliable illumination shall be provided for all exit facilities.

(7) In every building or structure of such size, arrangement, or occupancy that a fire may not itself provide adequate warning to occupants, fire alarm facilities shall be provided where necessary to warn occupants of the existence of fire so that they may escape, or to facilitate the orderly conduct of fire exit drills.

(8) Every building or structure, section, or area thereof of such size, occupancy, and arrangement that the reasonable safety of numbers of occupants may be endangered by the blocking of any single means of egress due to fire or smoke, shall have at least two means of egress remote from each other, so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency conditions.

(9) Compliance with this subpart shall not be construed as eliminating or reducing the necessity for other provisions for safety of persons using a structure under normal occupancy conditions, nor shall any provision of the subpart be construed as requiring or permitting any condition that may be hazardous under normal occupancy conditions.

(c) *Protection of employees exposed by construction and repair operations.* (1) No building or structure under construction shall be occupied in whole or in part until all exit facilities required for the part occupied are completed and ready for use.

(2) No existing building shall be occupied during repairs or alterations unless all existing exits and any existing fire protection are continuously maintained, or in lieu thereof other measures are taken which provide equivalent safety.

(3) No flammable or explosive substances or equipment for repairs or alterations shall be introduced in a building of normally low or ordinary hazard classification while the building is occupied, unless the condition of use and safeguards provided are such as not to create any additional danger or handicap to egress beyond the normally permissible conditions in the building.

(d) *Maintenance.* (1) Every required exit, way of approach thereto, and way of travel from the exit into the street or open space, shall be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

(2) Every automatic sprinkler system, fire detection and alarm system, exit lighting, fire door, and other item of equipment, where provided, shall be continuously in proper operating condition.

§ 1910.37 Means of egress, general.

(a) *Permissible exit components.* An exit shall consist only of the approved components. Exit components shall be constructed as an integral part of the building or shall be permanently affixed thereto.

(b) *Protective enclosure of exits.* When an exit is protected by separation from other parts of the building the separating construction shall meet the following requirements.

(1) The separation shall have at least a 1-hour fire resistance rating when the exit connects three stories or less. This applies whether the stories connected are above or below the story at which exit discharge begins.

(2) The separation shall have at least a 2-hour fire resistance rating when the exit connects four or more stories, whether above or below the floor of discharge. It shall be constructed of noncombustible materials, and shall be supported by construction having at least a 2-hour fire resistance rating.

(3) Any opening therein shall be protected by an approved self-closing fire door.

(4) Openings in exit enclosures shall be confined to those necessary for access to the enclosure from normally occupied spaces and for egress from the enclosure.

(c) *Width and capacity of means of egress.* (1) The capacity in number of persons per unit of exit width for approved components of means of egress shall be as follows:

(i) Level Egress Components (including Class A Ramps) 100 persons.

(ii) Inclined Egress Components (including Class B Ramps) 60 persons.

(iii) A ramp shall be designated as Class A or Class B in accordance with the following Table E–1:

TABLE E-1

	Class A	Class B
Width	44 inches and greater.	30 to 44 inches.
Slope	1 to $1\frac{3}{16}$ inches in 12 inches.	$1\frac{3}{16}$ to 2 inches in 12 inches.
Maximum height between landings.	No limit	12 feet.

(2) Means of egress shall be measured in units of exit width of 22 inches. Fractions of a unit shall not be counted, except that 12 inches added to one or more full units shall be counted as one-half a unit of exit width.

(3) Units of exit width shall be measured in the clear at the narrowest point of the means of egress except that a handrail may project inside the measured width on each side not more than 5 inches and a stringer may project inside the measured width not more than $1\frac{1}{2}$ inches. An exit or exit access door swinging into an aisle or passageway shall not restrict the effective width thereof at any point during its swing to less than the minimum widths hereafter specified.

(d) *Egress capacity and occupant load.* (1) The capacity of means of egress for any floor, balcony, tier, or other occupied space shall be sufficient for the occupant load thereof. The occupant load shall be the maximum number of persons that may be in the space at any time.

(2) Where exits serve more than one floor, only the occupant load of each floor considered individually need be used in computing the capacity of the exits at that floor, provided that exit capacity shall not be decreased in the direction of exit travel.

(e) *Arrangement of exits.* When more than one exit is required from a story, at least two of the exits shall be remote from each other and so arranged as to minimize any possibility that both may be blocked by any one fire or other emergency condition.

(f) *Access to exits.* (1) Exits shall be so located and exit accesss shall be so arranged that exits are readily accessible at all times. Where exits are not immediately accessible from an open floor area, safe and continuous passageways, aisles, or corridors leading directly to every exit and so arranged as to provide convenient access for each occupant to at least two exits by separate ways of travel, except as a single exit or limited dead ends are permitted by other provisions of this subpart, shall be maintained.

(2) A door from a room to an exit or to a way of exit access shall be of the side-hinged, swinging type. It shall swing with exit travel when the room is occupied by more than 50 persons or used for a high hazard occupancy.

(3) In no case shall access to an exit be through a bathroom, or other room subject to locking, except where the exit is required to serve only the room subject to locking.

(4) Ways of exit access and the doors to exits to which they lead shall be so designed and arranged as to be clearly recognizable as such. Hangings or draperies shall not be placed over exit doors or otherwise so located as to conceal or obscure any exit. Mirrors shall not be placed on exit doors. Mirrors shall not be placed in or adjacent to any exit in such a manner as to confuse the direction of exit.

(5) Exit access shall be so arranged that it will not be necessary to travel toward any area of high hazard occupancy in order to reach the nearest exit, unless the path of travel is effectively shielded from the high hazard location by suitable partitions or other physical barriers.

(6) The minimum width of any way of exit access shall in no case be less than 28 inches. Where a single way of exit access leads to an exit, its capacity in terms of width shall be at least equal to the required capacity of the exit to which it leads. Where more than one way of exit access leads to an exit, each shall have a width adequate for the number of persons it must accommodate.

(g) *Exterior ways of exit access.* (1) Access to an exit may be by means of any exterior balcony, porch, gallery, or roof that conforms to the requirements of this section.

(2) Exterior ways of exit access shall have smooth, solid floors, substantially level, and shall have guards on the unenclosed sides.

(3) Where accumulation of snow or ice is likely because of the climate, the exterior way of exit access shall be protected by a roof, unless it serves as the sole normal means of access to the rooms or spaces served, in which case it may be assumed that snow and ice will be regularly removed in the course of normal occupancy.

(4) A permanent, reasonably straight path of travel shall be maintained over the required exterior way of exit access. There shall be no obstruction by railings, barriers, or gates that divide the open space into sections appurtenant to individual rooms, apartments, or other uses. Where the Assistant Secretary of Labor or his duly authorized representative finds the required path of travel to be obstructed by furniture or other movable objects, he may require that they be fastened out of the way or he may require that railings or other permanent barriers be installed to protect the path of travel against encroachment.

(5) An exterior way of exit access shall be so arranged that there are no dead ends in excess of 20 feet. Any unenclosed exit served by an exterior way of exit access shall be so located that no part of the exit extends past a vertical plane 20 feet and one-half the required width of the exit from the end of and at right angles to the way of exit access.

(6) Any gallery, balcony, bridge, porch or other exterior exit access that projects beyond the outside wall of the building shall comply with the requirements of this section as to width and arrangement.

(h) *Discharge from exits.* (1) All exits shall discharge directly to the street, or to a yard, court, or other open space that gives safe access to a public way. The streets to which the exits discharge shall be of width adequate to accommodate all persons leaving the building. Yards, courts, or other open spaces to which exits discharge shall also be of adequate width and size to provide all persons leaving the building with ready access to the street.

(2) Stairs and other exits shall be so arranged as to make clear the direction of egress to the street. Exit stairs that continue beyond the floor of discharge shall be interrupted at the floor of discharge by partitions, doors, or other effective means.

(i) *Headroom.* Means of egress shall be so designed and maintained as to provide adequate headroom, but in no case shall the ceiling height be less than 7 feet 6 inches nor any projection from the ceiling be less than 6 feet 8 inches from the floor.

(j) *Changes in elevation.* Where a means of egress is not substantially level, such differences in elevation shall be negotiated by stairs or ramps.

(k) *Maintenance and workmanship* (1) Doors, stairs, ramps, passages, signs, and all other components of means of egress shall be of substantial, reliable construction and shall be built or installed in a workmanlike manner.

(2) Means of egress shall be continuously maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

(3) Any device or alarm installed to restrict the improper use of an exit shall be so designed and installed that it cannot, even in cases of failure, impede or prevent emergency use of such exit.

(l) *Furnishings and decorations.* (1) No furnishings, decorations, or other objects shall be so placed as to obstruct exits, access thereto, egress therefrom, or visibility thereof.

(2) No furnishings or decorations of an explosive or highly flammable character shall be used in any occupancy.

(m) *Automatic sprinkler systems.* All automatic sprinkler systems shall be continuously maintained in reliable operating condition at all times, and such periodic inspections and tests shall be made as are necessary to assure proper maintenance.

(n) *Alarm and fire protection systems.* (1) Systems shall be under the supervision of a responsible person who shall cause proper tests to be made at weekly intervals and have general charge of all alterations and additions.

(2) Fire alarm signaling equipment shall be restored to service as promptly as possible after each test or alarm, and shall be kept in normal condition for operation. Equipment requiring rewinding or replenishing shall be rewound or replenished as promptly as possible after each test or alarm.

(o) *Fire retardant paints.* Fire retardant paints or solutions shall be renewed at such intervals as necessary to maintain the necessary flame retardant properties.

(p) [Reserved]

(q) *Exit marking.* (1) Exits shall be marked by a readily visible sign. Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants.

(2) Any door, passage, or stairway which is neither an exit nor a way of exit access, and which is so located or arranged as to be likely to be mistaken for an exit, shall be identified by a sign reading "Not an Exit" or similar designation, or shall be identified by a sign indicating its actual character, such as "To Basement," "Storeroom," "Linen Closet," or the like.

(3) Every required sign designating an exit or way of exit access shall be so located and of such size, color, and design as to be readily visible. No decorations, furnishings, or equipment which impair visibility of an exit sign shall be permitted, nor shall there be any brightly illuminated sign (for other than exit purposes), display, or object in or near the line of vision to the required exit sign of such a character as to so detract attention from the exit sign that it may not be noticed.

(4) Every exit sign shall be distinctive in color and shall provide contrast with decorations, interior finish, or other signs.

(5) A sign reading "Exit", or similar designation, with an arrow indicating the direction, shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

(6) Every exit sign shall be suitably illuminated by a reliable light source giving a value of not less than 5-foot candles on the illuminated surface. Artificial lights giving illumination to exit signs other than the internally illuminated types shall have screens, discs, or lenses of not less than 25 square inches area made of translucent material to show red or other specified designating color on the side of the approach.

(7) Each internally illuminated exit sign shall be provided in all occupancies where reduction of normal illumination is permitted.

(8) Every exit sign shall have the word "Exit" in plainly legible letters not less than 6 inches high, with the principal strokes of letters not less than three-fourths-inch wide.

§ 1910.38 Specific means of egress requirements by occupancy. [Reserved]

§ 1910.39 Sources of standards.

The entire subpart is promulgated from NFPA 101-1970, Life Safety Code.

§ 1910.40 Standards organizations.

Specific standards of the following organization have been referenced in this subpart. Copies of the standards may be obtained from the issuing organization:

National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.

Subpart F—Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms

§ 1910.66 Power platforms for exterior building maintenance.

(a) *Definitions applicable to this section*—(1) *Angulated roping.* A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

(2) *ANSI.* American National Standards Institute.

(3) *Babbitted fastenings.* The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

(4) *Brake—disc type.* A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

(5) *Brake—self-energizing band type.* An essentially unidirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum will act to increase the tension or holding force of the band.

(6) *Brake—shoe type.* A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

(7) *Building face rollers.* A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

(8) *Continuous pressure.* Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

(9) *Control.* A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

(10) *Controller.* A device or group of devices, usually contained in a single enclosure, which serves to control in some predetermined manner the apparatus to which it is connected.

(11) *Electrical ground.* A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

(12) *Guide roller.* A rotating, bearing-mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

(13) *Guide shoe.* An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

(14) *Interlock.* A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

(15) *Operating* device. A pushbutton, lever, or other manual device used to actuate a control.

(16) *Powered platform.* Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power-operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

(17) *Rated load.* The combined weight of employees, tools, equipment, and other material which the working platform is designed and installed to lift.

(18) *Relay, direction.* An electrically energized contactor responsive to an initiating control circuit, which in turn

causes a moving member to travel in a particular direction.

(19) *Relay, potential for vertical travel.* An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition, "relay, direction."

(20) *Roof car.* A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

(21) *Roof-powered platform.* A powered platform having the raising and lowering mechanism located on a roof car.

(22) *Self-powered platform.* A powered platform having the raising and lowering mechanism located on the working platform.

(23) *Traveling cable.* A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

(24) *Weatherproof.* Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

(25) *Working platform.* The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

(26) *Yield point.* The stress at which the material exhibits a permanent set of 0.2 percent.

(27) *Zinced fastenings.* The method of providing wire rope attachments in which the splayed or fanned wire ends are held in a tapered socket by means of poured molten zinc.

(b) *General requirements*—(1) *Application.* (i) This section establishes safety requirements for the design, construction, installation, operation, maintenance, inspection, and use of power-operated platforms for exterior building maintenance. The requirements of this section do not apply to temporary equipment used for construction work; or to devices which are raised and lowered manually.

(ii) The purpose of this standard is to provide for the safety of life and limb of users of exterior powered platforms, as well as of others who may be exposed. The equipment described in this section is intended for use by one or more workmen who are engaged in exterior work, such as window cleaning, caulking, metal-polishing, and general exterior building maintenance or repairs.

(2) *Existing and new equipment.* This section applies to all powered platforms installed subsequent to the effective date of these regulations with the exception of powered platforms installed for emergency purposes.

(3) *Design requirements.* All new powered platforms for exterior building maintenance purchased and used after the effective date of these regulations shall meet all of the design, construction, installation, and maintenance requirements of Part II and III of the "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance ANSI A120.1–1970" and of this section. Reference shall be made to appropriate parts of ANSI A120.1–1970 for detail specifications for equipment and special installations.

(4) *Limitation.* The requirements of this section apply only to electric powered platforms. It is not the intent of this section to prohibit the use of other types of power. Installation of powered platforms using other types of power is permitted, provided such platforms have adequate protective devices for the type of power used, and otherwise provide for reasonable safety of life and limb to users of equipment and to others who may be exposed.

(5) *Types of powered platforms.* (i) For the purpose of applying this standard, powered platforms are divided into two basic types, Type F and Type T.

(ii) Powered platforms designated as Type F shall meet all the requirements in Part II of ANSI A120.1—1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type F equipment is that the work platform is suspended by at least four wire ropes and designed so that failure of any one wire rope will not substantially alter the normal position of the working platform. Another basic requirement of Type F equipment is that only one layer of hoisting rope is permitted on winding drums. Type F powered platforms may be either roof-powered or self-powered.

(iii) Powered platforms designated as Type T shall meet all the requirements in Part III of ANSI A120.1—1970 American National Standard Safety Requirement for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type T equipment is that the working platform is suspended by at least two wire ropes. Failure of one wire rope would not permit the working platform to fall to the ground, but would upset its normal position. The employer shall require employees working on Type T equipment to wear safety belts, which are attached by lifelines to either the working platform or the building structure. Type T powered platforms may be either roof-powered or self-powered.

(iv) The requirements of this section apply to powered platforms with winding drum type hoisting machines. It is not the intent of this section to prohibit powered platforms using other types of hoisting machines such as, but not limited to, traction drum hoisting machines, air powered machines, hydraulic powered machines, and internal combustion machines. Installation of powered platforms with other types of hoisting machines is permitted, provided adequate protective devices are used, and provided reasonable safety of life and limb to users of the equipment and to others who may be exposed is assured.

(c) *Type F powered platforms*—(1) *Roof car, general.* (i) A roof car shall be provided whenever it is necessary to move the working platform horizontally to working or storage positions.

(ii) The maximum rated speed at which a power traversed roof car may be moved in a horizontal direction shall be 50 feet per minute.

(2) *Movement and positioning of roof car.* (i) Provision shall be made to protect against having the roof car leave the roof or enter roof areas not designed for travel.

(ii) The horizontal motion of the roof cars shall be positively controlled so as to insure proper movement and positioning of the roof car.

(iii) Roof car positioning devices shall be provided to insure that the working platform is placed and retained in proper position for vertical travel and during storage.

(iv) Mechanical stops shall be provided to prevent the traversing of the roof car beyond its normal limits of travel. Such stops shall be capable of withstanding a force equal to 100 percent of the inertial effect of the roof car in motion with traversing power applied.

(v) (*a*) The operating device of a power-operated roof car for traversing shall be located on the roof car, the working platform, or both, and shall be of the continuous pressure weatherproof electric type. If more than one operating device is provided, they shall be so arranged that traversing is possible only from one operating device at a time.

(*b*) The operating device shall be so connected that it is not operable until:

(*1*) The working platform is located at its uppermost position of travel and is not in contact with the building face or fixed vertical guides in the face of the building; and

(*2*) All protective devices and interlocks are in a position for traversing.

(3) *Roof car stability.* Roof car stability shall be determined by either subdivision (i) or (ii) of this subparagraph, whichever is greater.

(i) The roof car shall be continuously stable, considering overturning moment as determined by 125 percent rated load, plus maximum dead load and the prescribed wind loading.

(ii) The roof car and its anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform and this calculated value shall include the effect of one and one-half times the value. For this calculation, the simultaneous effect of one-half wind load shall be included, and the design stresses shall not exceed those referred to in paragraph (b)(3) of this section.

(iii) If the load on the motors is at any time in excess of three times that required for lifting the working platform with its rated load, the motor shall stall.

(4) *Access to the roof car.* Safe access to the roof car and from the roof car to the working platform shall be provided. If the access to the roof car at any point of its travel is not over the roof area or where otherwise necessary for safety, self-closing, self-locking gates shall be

provided. Applicable provisions of the American National Standard Safety Requirements for Floor and Wall Openings, Railings and Toeboard, A12.1–1967, shall apply.

(5) *Means for maintenance, repair, and storage.* Means shall be provided to run the roof car away from the roof perimeter, where necessary, and to provide a safe area for maintenance, repairs, and storage. Provisions shall be made to secure the machine in the stored position. For stored machines subject to wind forces, see special design and anchorage requirements for "wind forces" in Part II, section 10.5.1.1 of ANSI A120.1—1970, American National Standards Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(6) *General requirements for working platforms.* The working platform shall be of girder or truss construction and shall be adequate to support its rated load under any position of loading, and comply with the provisions set forth in section 10 of ANSI A120.1—1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(7) *Load rating plate.* Each working platform shall bear a manufacturer's load rating plate, conspicuously posted; stating the maximum permissible rated load. Load rating plates shall be made of noncorrosive material and shall have letters and figures stamped, etched, or cast on the surface. The minimum height of the letters and figures shall be one-fourth inch.

(8) *Minimum size.* The working platform shall have a minimum net width of 24 inches.

(9) *Guard rails.* Working platforms shall be furnished with permanent guard rails not less than 36 inches high, and not more than 42 inches high at the front (building side). At the rear, and on the sides, the rail shall not be less than 42 inches high. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard.

(10) *Toeboards.* A 4-inch toeboard shall be provided along all sides of the working platform.

(11) *Open spaces between guardrails and toeboards.* The spaces between the intermediate guardrail and platform toeboard on the building side of the working platform, and between the top guardrail and the toeboard on other sides of the platform, shall be filled with metallic mesh or similar material that will reject a ball 1 inch in diameter. The installed mesh shall be capable of withstanding a load of 100 pounds applied horizontally over any area of 144 square inches. If the space between the platform and the building face does not exceed 8 inches, and the platform is restrained by guides, the mesh may be omitted on the front side.

(12) *Flooring.* The platform flooring shall be of the nonskid type, and if of open construction, shall reject a $\frac{9}{16}$-inch diameter ball, or be provided with a screen below the floor to reject a $\frac{9}{16}$-inch diameter ball.

(13) *Access gates.* Where access gates are provided, they shall be self-closing and self-locking.

(14) *Operating device for vertical movement of the working platform.* (i) The normal operating device for the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.

(ii) The operating device shall be operable only when all electrical protective devices and interlocks on the working platform are in position for normal service, and the roof car, if provided, is at an established operating point.

(15) *Emergency electric operative device.* (i) In addition, on roof-powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the normal operating device for the working platform, or failure of the traveling cable system. The emergency operating device shall be mounted in a locked compartment and shall have a legend mounted thereon reading: "For Emergency Operation Only. Establish Communication With Personnel on Working Platform Before Use."

(ii) A key for unlocking the compartment housing the emergency operating device shall be mounted in a break-glass receptacle located near the emergency operating device.

(16) *Manual cranking for emergency operation.* Emergency operation of the main drive machine may be provided to allow manual cranking. This provision for manual operation shall be designed so that not more than two persons will be required to perform this operation. The access to this provision shall include a means to automatically make the machine inoperative electrically while under the emergency manual operation. The design shall be such that the emergency brake is operative at or below governor tripping speed during manual operation.

(17) *Arrangement and guarding of hoisting equipment.* (i) Hoisting equipment shall consist of a power-driven drum or drum contained in the roof car (roof-powered platforms) or contained on the working platform (self-powered platform).

(ii) The hoisting equipment shall be power-operated in both up and down directions.

(iii) Guard or other protective devices shall be installed wherever rotating shafts or other mechanisms or gears may expose personnel to a hazard.

(iv) Friction devices or clutches shall not be used for connecting the main driving mechanism to the drum or drums. Belt- or chain-driven machines are prohibited.

(18) *Hoisting motors.* (i) Hoisting motors shall be electric and of weatherproof construction.

(ii) Hoisting motors shall be in conformance with applicable provisions of subparagraph (22) of this paragraph, Electrical wiring and equipment.

(iii) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.

(19) *Brakes.* The hoisting machine(s) shall have two independent braking means, each designed to stop and hold the working platform with 125 percent of rated load.

(20) *Hoisting ropes and rope connections.* (i) Working platforms shall be suspended by wire ropes of either 6 x 19 or 6 x 37 classification, preformed or nonpreformed.

(ii) The minimum grade of the wire rope shall be improved plow steel. Ropes shall be fabricated of drawn galvanized or bright wire. Drawn galvanized wire rope shall be fabricated of individual wires on which the zinc coating has been applied at an intermediate size, and the wire then drawn to finished size and to the same tolerances and with the same mechanical properties as for uncoated wire of equal grade.

(iii) The minimum factor of safety shall be ten, and shall be calculated by the following formula:

$$F = \frac{S \times N}{W}$$

where

S=Manufacturer's rated breaking strength of one rope.

N=Number of ropes under load.

W=Maximum static load on all ropes with the platform and its rated load at any point of its travel.

(iv) Hoisting ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less than five-sixteenths-inch diameter.

(v) Winding drums shall have at least three turns of rope remaining when the platform has landed at the lowest possible point of its travel.

(vi) The lengthening or repairing of wire rope by the joining of two or more lengths is prohibited.

(vii) The nondrum ends of the hoisting ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths, if required.

(viii) Reverse bends in rope arrangement should be avoided. More than two reverse bends in each rope is prohibited.

(21) *Rope tag data.* (i) A metal data tag shall be securely attached to one of the wire rope fastenings. This data tag shall bear the following wire rope data:

(*a*) The diameter in inches.

(*b*) Construction classification.

(*c*) Whether nonpreformed or preformed.

(*d*) The grade of material used.

(*e*) The manufacturer's rated breaking strength.

(*f*) Name of the manufacturer of the rope.

(*g*) The month and year the ropes were installed.

(*h*) Name of the person or firm who installed ropes.

(ii) Noncorrosive metal data tags shall be used. The minimum height of the letters, stamped or etched, shall be one-sixteenth inch.

(iii) A new tag shall be installed at each rope renewal. When ropes are refastened, the original tag shall be retained and a supplemental tag showing the date of refastening and the name of the person or firm who refastened the ropes shall be provided.

(22) *Electrical wiring and equipment.* (i) All electrical equipment and wiring shall conform to the requirements of the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968), except as modified by ANSI A120.1–1970 "American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance." For detail design specifications for electrical equipment, see Part 2, ANSI A120.1–1970.

(ii) All motors and operation and control equipment shall be supplied from a single power source.

(iii) The power supply for the powered platform shall be an independent circuit supplied through a fused disconnect switch.

(iv) Electrical conductor parts of the power supply system shall be protected against accidental contact.

(v) Electrical grounding shall be provided.

(*a*) Provision for electrical grounding shall be included with the power-supply system.

(*b*) Controller cabinets, motor frames, hoisting machines, the working platform, roof car and roof car track system, and noncurrent carrying parts of electrical equipment, where provided, shall be grounded.

(*c*) The controller, where used, shall be so designed and installed that a single ground or short circuit will not prevent both the normal and final stopping device from stopping the working platform.

(*d*) Means shall be provided on the roof car and working platform for grounding portable electric tools.

(*e*) The working platform shall be grounded through a grounding connection in a traveling cable. Electrically powered tools utilized on the working platform shall be grounded.

(vi) Electrical receptacles located on the roof or other exterior location shall be of a weatherproof type and shall be located so as not to be subject to contact with water or accumulated snow. The receptacles shall be grounded and the electric cable shall include a grounding conductor. The receptacle and plug shall be a type designed to avoid hazard to persons inserting or withdrawing the plug. Provision shall be made to prevent application of cable strain directly to the plug and receptacle.

(vii) Electric runway conductor systems shall be of the type designed for use in exterior locations and shall be located so as not to be subject to contact with water or accumulated snow. The conductors, collectors, and disconnecting means shall conform to the same requirements as those for cranes and hoists in Article 610 of the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968). A grounded conductor shall parallel the power conductors and be so connected that it cannot be opened by the disconnecting means. The system shall be designed to avoid hazard to persons in the area.

(viii) Electrical protective devices and interlocks of the weatherproof type shall be provided.

(ix) Where the installation includes a roof car, electric contact(s) shall be provided and so connected that the operating devices for the working platform shall be operative only when the roof car is located and mechanically retained at an established operating point.

(x) Where the powered platform includes a power-operated roof car, the operating device for the roof car shall be inoperative when the roof car is mechanically retained at an established operating point.

(xi) An electric contact shall be provided and so connected that it will cause the down direction relay for vertical travel to open if the tension in the traveling cable exceeds safe limits.

(xii) An automatic overload device shall be provided to cut off the electrical power to the circuit in all hoisting motors for travel in the up direction, should the load applied to the hoisting ropes at either end of the working platform exceed 125 percent of its normal tension with rated load, as shown on the manufacturer's data plate on the working platform.

(xiii) An automatic device shall be provided for each hoisting rope which will cut off the electrical power to the hoisting motor or motors in the down direction and apply the brakes if any hoisting rope becomes slack.

(xiv) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.

(xv) Operation of a directional limit device shall prevent further motion in the appropriate direction, if the normal limit of travel has been reached.

(xvi) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.

(xvii) Final terminal stopping devices of the working platform:

(*a*) Final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from overtraveling at the terminals.

(*b*) The device shall be set to function as close to each terminal landing as practical, but in such a way that under normal operating conditions it will not function when the working platform is stopped by the normal terminal stopping device.

(*c*) Operation of the final terminal stopping device shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine, and applying both the primary and secondary brakes.

(*d*) The final terminal stopping device for the upper limit of travel shall be mounted so that it is operated directly by the motion of the working platform itself.

(xviii) Emergency stop switches shall be provided in or adjacent to each operating device.

(xix) Emergency stop switches shall:

(*a*) Have red operating buttons or handles.

(*b*) Be conspicuously and permanently marked "Stop".

(*c*) Be the manually opened and manually closed type.

(*d*) Be positively opened with the opening not solely dependent on springs.

(xx) The manual operation of an emergency stop switch associated with an operating device for the working platform shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine and applying both the primary and secondary brakes.

(xxi) The manual operation of the emergency stop switch associated with the operating device for a power-driven roof car shall cause the electrical power to the traverse machine to be interrupted, and the traverse machine brake to apply.

(23) *Requirements for emergency communications.* (i) Communication equipment shall be provided for each powered platform for use in an emergency.

(ii) Two-way communication shall be established between personnel on the roof and personnel on the stalled working platform before any emergency operation of the working platform is undertaken by personnel on the roof.

(iii) The equipment shall permit two-way voice communication between the working platform and

(*a*) Designated personnel continuously available while the powered platform is in use; and

(*b*) Designated personnel on roof-powered platforms, undertaking emergency operation of the working platform by means of the emergency operating device located near the hoisting machine.

(iv) The emergency communication equipment shall be one of the following types:

(*a*) Telephone connected to the central telephone exchange system; or

(*b*) Telephones on a limited system or an approved two-way radio system, provided designated personnel are available to receive a message during the time the powered platform is in use.

(d) *Type T powered platforms*—(1) *Roof car.* The requirements of paragraphs (c)(1) through (c)(5) of this section shall apply to Type T powered platforms.

(2) *Working platform.* The requirements of paragraphs (c)(6) through (c)(16) of this section apply to Type T powered platforms.

(i) The working platform shall be suspended by at least two wire ropes.

(ii) The maximum rated speed at which the working platform of self-powered platforms may be moved in a vertical direction shall not exceed 35 feet per minute.

(3) *Hoisting equipment.* The requirements of paragraphs (c) (17) and (18) of this section shall apply to Type T powered platforms.

(4) *Brakes.* Brakes requirements of paragraph (c) (19) of this section shall apply.

(5) *Hoisting ropes and rope connections.* (i) Paragraph (c) (20) (i) through (vi) and (viii) of this section shall apply to type T powered platforms.

(ii) Adjustable shackle rods in subparagraph (c) (20) (vii) of this section shall apply to type T powered platforms if the working platform is suspended by more than two wire ropes.

(6) *Electrical wiring and equipment.* (i) The requirements of paragraph (c) (22) (i) through (vi) of this section shall apply to type T powered platforms. "Circuit protection limitation," "powered platform electrical service system," all operating services and control equipment shall comply with the specifications contained in Part 2, section 26, of ANSI A120.1–1970.

(ii) For electrical protective devices the requirements of paragraph (c) (22) (i) through (viii) of this section shall apply to type T powered platforms. Requirements for the "circuit potential limitation" shall be in accordance with the specifications contained in Part 2, section 26, of ANSI A120.1–1970.

(7) *Emergency communications.* All the requirements of paragraph (c) (23) of this section shall apply to type T powered platforms.

(8) *Safety belts and lifelines.* (i) Each employee on the working platform of type T powered platforms shall be provided with a safety belt with means for attachment to a lifeline on the roof or to the working platform. It is recommended that safety belts, lines and other components, including fastening means and anchorages to the working platform, building, or structure, be capable of withstanding a static load of 4,000 pounds without damage or permanent deformation of any part.

(ii) Fastening devices should be of the self-closing type, equipped with a locking device to prevent accidental opening of the fastening device.

(iii) Harness-type belts are recommended. If body-type belts are used, it is recommended that the portion of the belt bearing on the front of the wearer's body have a minimum width of 3 inches.

(iv) It is recommended that the line used to connect the belt to the platform, or to a lifeline attached to the building, have a maximum length of 5 feet.

(e) *Inspections and tests*—(1) *Inspections and tests of new installations and alterations.* All powered platform installations shall, on their completion, and before being placed in service, be subjected to an acceptance test in the field to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment functions as required. A similar inspection and test shall be made following a major alteration to an existing installation.

(2) *Periodic inspections and tests.* Each installation shall undergo a periodic inspection and test at least every 12 months. All parts of the equipment shall be inspected, and where necessary, tested to determine that they are in safe operating condition.

(3) *Maintenance inspections and tests.* Each installation shall undergo a maintenance inspection and test every 30 days, except where the cleaning cycle is less than 30 days such inspection and test shall be made prior to each cleaning cycle. The results of these inspections and tests shall be recorded in a log which is available for review by the Assistant Secretary of Labor or his designated representative. Each log entry shall include the date of the inspection or test and shall be signed by the person making the inspection or test.

(4) *Special inspection of governors and secondary brakes.* (i) Special inspections and tests of the governor and secondary braking system shall be made at intervals not exceeding 1 year.

(ii) The inspection and test shall include a verification that the initiating device for the secondary breaking operates at the proper overspeed.

(iii) If adequate tests cannot be performed in the field, the initiating device may be removed from the powered platform and sent to a shop equipped to make such a test.

(iv) The inspection shall include a verification of the proper functioning of the secondary brake. If an adequate test cannot be performed in the field, the hoisting machine may be removed from the building and sent to a shop equipped to make such a test.

(v) If any hoisting machine or initiating device for the secondary brake system is removed from the building for testing, all reinstalled and directly related components shall be reinspected prior to returning the powered platform installation to service.

(5) *Adverse weather.* The operation of powered platforms during severe adverse weather conditions is prohibited.

(6) *Maintenance.* (i) Required maintenance. All parts of equipment on which safe operation depends shall be maintained in proper working order so that they perform the function for which they are intended.

(ii) Broken or worn parts, worn switch contacts, brushes, and short flexible conductors of electrical devices, which may interfere with safe operation, shall be replaced promptly. Electrical receptacles and plugs shall be replaced promptly when worn or damaged. All electrical connections shall be kept tight.

(iii) Components of the electrical service system and traveling cables shall be replaced when damaged or substantially abraded.

(iv) Gears, shafts, bearings, brakes, and hoisting drums shall be maintained in proper alinement. Gears shall be replaced promptly when there is evidence of appreciable wear.

(7) *Cleaning.* (i) Controller contactors and relays shall be kept clean and free from dirt.

(ii) All other parts shall be kept clean, if their proper functioning would be affected by the presence of dirt or other contaminants.

(8) *Periodic reshackling of hoisting ropes.* The hoisting ropes shall be reshackled at the nondrum ends at intervals not exceeding 24 months. In reshackling the ropes, a sufficient length shall be cut from the end of the rope to remove damaged or fatigued portions.

(9) *Making safety devices inoperative.* No person shall at any time make any required safety device or electrical protective device inoperative, except when necessary during tests, inspections, and maintenance. Immediately upon completion of such test, inspections, and maintenance, the devices shall be restored to their normal operating condition.

(10) *Damaged rope.* Wire ropes shall be replaced whenever there are six or more broken wires in any one lay of the wire rope, or whenever the ropes are damaged or in a deteriorated condition.

(11) *Roof track system.* Roof track systems, tiedowns, or similar equipment, if provided, shall be maintained in proper working order so that they perform the function for which they are intended.

(12) *Building face guiding members.* T-rails, indented mullions, or equivalent guides located in the face of the building, if provided, shall be maintained in proper working order so that they perform the function for which they are intended. Brackets for cable stabilizers, if provided, shall similarly be maintained in proper working order.

§ 1910.67 Vehicle-mounted elevating and rotating work platforms.

(a) *Definitions applicable to this section*—(1) *Aerial device.* Any vehicle-mounted device, telescoping or articulating, or both, which is used to position personnel.

(2) *Aerial ladder.* An aerial device consisting of a single- or multiple-section extensible ladder.

(3) *Articulating boom platform.* An aerial device with two or more hinged boom sections.

(4) *Extensible boom platform.* An aerial device (except ladders) with a telescopic or extensible boom. Telescopic derricks with personnel platform attachments shall be considered to be extensible boom platforms when used with a personnel platform.

(5) *Insulated aerial device.* An aerial device designed for work on energized lines and apparatus.

(6) *Mobile unit.* A combination of an aerial device, its vehicle, and related equipment.

(7) *Platform.* Any personnel-carrying device (basket or bucket) which is a component of an aerial device.

(8) *Vehicle.* Any carrier that is not manually propelled.

(9) *Vertical tower.* An aerial device designed to elevate a platform in a substantially vertical axis.

(b) *General requirements*—(1) *Application.* (i) This section relates to the following types of vehicle-mounted aerial devices used to elevate personnel to job sites above ground:

(*a*) Extensible boom platforms.

(*b*) Aerial ladders.

(*c*) Articulating boom platforms.

(*d*) Vertical towers.

(*e*) A combination of any of the above.

These devices are made of metal, wood, fiberglass reinforced plastic (FRP), or other material and are powered or manually operated, whether or not they are capable of rotating about a substantially vertical axis.

(ii) The requirements of this section do not include any matter relating to firefighting equipment or any matter relating to the vehicles upon which aerial devices are mounted, except in respect to a vehicle being a stable support for the aerial device.

(2) *Design requirements.* All new vehicle-mounted elevating and rotating work platforms after the effective date of these regulations shall meet the design, construction, and test specifications of the "American National Standard for Vehicle-Mounted Elevating and Rotating Work Platforms ANSI A92.2–1969."

§ 1910.68 Manlifts.

(a) *Definitions applicable to this section*—(1) *Handhold (Handgrip).* A handhold is a device attached to the belt which can be grasped by the passenger to provide a means of maintaining balance.

(2) *Open type.* One which has a handgrip surface fully exposed and capable of being encircled by the passenger's fingers.

(3) *Closed type.* A cup-shaped device, open at the top in the direction of travel of the step for which it is to be used, and closed at the bottom, into which the passenger may place his fingers.

(4) *Limit switch.* A device, the purpose of which is to cut off the power to the motor and apply the brake to stop the carrier in the event that a loaded step passes the terminal landing.

(5) *Manlift.* A device consisting of a power-driven endless belt moving in one direction only, and provided with steps or platforms and handholds attached to it for the transportation of personnel from floor to floor.

(6) *Rated speed.* Rated speed is the speed for which the device is designed and installed.

(7) *Split-rail switch.* An electric limit switch operated mechanically by the rollers on the manlift steps. It consists of an additional hinged or "split" rail, mounted on the regular guiderail, over which the step rollers pass. It is spring-loaded in the "split" position. If the step supports no load, the rollers will "bump" over the switch; if a loaded step should pass over the section, the split rail will be forced straight, tripping the switch and opening the electrical circuit.

(8) *Step (platform).* A step is a passenger carrying unit.

(9) *Travel.* The travel is the distance between the centers of the top and bottom pulleys.

(b) *General requirements*—(1) *Application.* This section applies to the construction, maintenance, inspection, and operation of manlifts in relation to accident hazards. Manlifts covered by this section consist of platforms or brackets and accompanying handholds mounted on, or attached to an endless belt, operating vertically in one direction only and being supported by, and driven through pulleys, at the top and bottom. These manlifts are intended for conveyance of persons only. It is not intended that this section cover moving stairways, elevators with enclosed platforms ("Paternoster" elevators), gravity lifts, nor conveyors used only for conveying material. This section applies to manlifts used to carry only personnel trained and authorized by the employer in their use.

(2) *Purpose.* The purpose of this section is to provide reasonable safety for life and limb.

(3) *Design requirements.* All new manlift installations and equipment installed after the effective date of these regulations shall meet the design requirements of the "American National Safety Standard for Manlifts ANSI A90.1–1969", and the requirements of this section.

(4) Reference to other codes and subparts. The following codes, and subparts of this part, are applicable to this section. Safety Code for Mechanical Power Transmission Apparatus ANSI B15.1–1953 (R 1958) and Subpart O; National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968) and Subpart S; Safety Code for Fixed Ladders, ANSI A14.3–1956 and Safety Requirements for Floor and Wall Openings, Railings and Toeboards, ANSI A12.1–1967 and Subpart D.

(5) *Floor openings*—(i) *Allowable size.* Floor openings for both the "up" and "down" runs shall be not less than 28 inches nor more than 36 inches in width for a 12-inch belt; not less than 34 inches nor more than 38 inches for a 14-inch belt; and not less than 36 inches nor more than 40 inches for a 16-inch belt and shall extend not less than 24 inches, nor more than 28 inches from the face of the belt.

(ii) *Uniformity.* All floor openings for a given manlift shall be uniform in size and shall be approximately circular, and each shall be located vertically above the opening below it.

(6) *Landing*—(i) *Vertical clearance.* The clearance between the floor or mounting platform and the lower edge for the conical guard above it required by subparagraph (7) of this paragraph shall not be less than 7 feet 6 inches. Where this clearance cannot be obtained no access to the manlift shall be provided and the manlift runway shall be enclosed where it passes through such floor.

(ii) *Clear landing space.* The landing space adjacent to the floor openings shall be free from obstruction and kept clear at all times. This landing space shall be at least 2 feet in width from the edge of the floor opening used for mounting and dismounting.

(iii) *Lighting and landing.* Adequate lighting, not less than 5-foot candles, shall be provided at each floor landing at all times when the lift is in operation.

(iv) *Landing surface.* The landing surfaces at the entrances and exits to the manlift shall be constructed and maintained as to provide safe footing at all times.

(v) *Emergency landings.* Where there is a travel of 50 feet or more between floor landings, one or more emergency landings shall be provided so that there will be a landing (either floor or emergency) for every 25 feet or less of manlift travel.

(*a*) Emergency landings shall be accessible from both the "up" and "down" rungs of the manlift and shall give access to the ladder required in subparagraph (12) of this paragraph.

(*b*) Emergency landings shall be completely enclosed with a standard railing and toeboard.

(*c*) Platforms constructed to give access to bucket elevators or other equipment for the purpose of inspection, lubrication, and repair may also serve as emergency landings under this rule. All such platforms will then be considered part of the emergency landing and shall be provided with standard railings and toeboards.

(7) *Guards on underside of floor openings*—(i) *Fixed type.* On the ascending side of the manlift floor openings shall be provided with a bevel guard or cone meeting the following requirements:

(*a*) The cone shall make an angle of not less than 45° with the horizontal. An angle of 60° or greater shall be used where ceiling heights permit.

(*b*) The lower edge of this guard shall extend at least 42 inches outward from any handhold on the belt. It shall not extend beyond the upper surface of the floor above.

(*c*) The cone shall be made of not less than No. 18 U.S. gauge sheet steel or material of equivalent strength or stiffness. The lower edge shall be rolled to a minimum diameter of one-half inch and the interior shall be smooth with no rivets, bolts or screws protruding.

(ii) *Floating type.* In lieu of the fixed guards specified in subdivision (i) of this subparagraph a floating type safety cone may be used, such floating cones to be mounted on hinges at least 6 inches below the underside of the floor and so constructed as to actuate a limit switch should a force of 2 pounds be applied on the edge of the cone closest to the hinge. The depth of this floating cone need not exceed 12 inches.

(8) *Protection of entrances and exits*—(i) *Guardrail requirement.* The entrances and exits at all floor landings affording access to the manlift shall be guarded by a maze (staggered railing) or a handrail equipped with self-closing gates.

(ii) *Construction.* The rails shall be standard guardrails with toeboards meeting the provisions of the Safety Requirements for Floor and Wall Openings, Railings and Toeboards, ANSI A12.1–1967 and section 1910.23.

(iii) *Gates.* Gates, if used, shall open outward and shall be self-closing. Corners of gates shall be rounded.

(iv) *Maze.* Maze or staggered openings shall offer no direct passage between enclosure and outer floor space.

(v) Except where building layout prevents, entrances at all landings shall be in the same relative position.

(vi) If located in buildings to which the public has access, such manlift or manlifts shall be located in an enclosure protected by self-closing spring-locked doors. Keys to such doors shall be limited to authorized personnel.

(9) *Guards for openings*—(i) *Construction.* The floor opening at each landing shall be guarded on sides not used for entrance or exit by a wall, a railing and toeboard or by panels of wire mesh of suitable strength.

(ii) *Height and location.* Such rails or guards shall be at least 42 inches in height on the up-running side and 66 inches on the down-running side.

(10) *Bottom arrangement*—(i) *Bottom landing.* At the bottom landing the clear area shall be not smaller than the area enclosed by the guardrails on the floors above, and any wall in front of the down-running side of the belt shall be not less than 48 inches from the face of the belt. This space shall not be encroached upon by stairs or ladders.

(ii) *Location of lower pulley.* The lower (boot) pulley shall be installed so that it is supported by the lowest landing served. The sides of the pulley support shall be guarded to prevent contact with the pulley or the steps.

(iii) *Mounting platform.* A mounting platform shall be provided in front or to one side of the uprun at the lowest landing, unless the floor level is such that the following requirement can be met: The floor or platform shall be at or above the point at which the upper surface of the ascending step completes its turn and assumes a horizontal position.

(iv) *Guardrails.* To guard against persons walking under a descending step, the area on the downside of the manlift shall be guarded in accordance with subparagraph (8) of this paragraph. To guard against a person getting between the mounting platform and an ascending step, the area between the belt and the platform shall be protected by a guardrail.

(11) *Top arrangements*—(i) *Clearance from floor.* A top clearance shall be provided of at least 11 feet above the top terminal landing. This clearance shall be maintained from a plane through each face of the belt to a vertical cylindrical plane having a diameter 2 feet greater than the diameter of the floor opening, extending upward from the top floor to the ceiling on the up-running side of the belt. No encroachment of structural or machine supporting members within this space will be permitted.

(ii) *Pulley clearance.* (*a*) There shall be a clearance of at least 5 feet between the center of the head pulley shaft and any ceiling obstruction.

(*b*) The center of the head pulley shaft shall be not less than 6 feet above the top terminal landing.

(iii) *Emergency grab rail.* An emergency grab bar or rail and platform shall be provided at the head pulley when the distance to the head pulley is over 6 feet above the top landing, otherwise only a grab bar or rail is to be provided to permit the rider to swing free should the emergency stops become inoperative.

(12) *Emergency exit ladder.* A fixed metal ladder accessible from both the "up" and "down" run of the manlift shall be provided for the entire travel of the manlift. Such ladder shall be in accordance with the existing ANSI A14.3-1956. Safety Code for Fixed Ladders and section 1910.27.

(13) *Superstructure bracing.* Manlift rails shall be secured in such a manner as to avoid spreading, vibration, and misalinement.

(14) *Illumination*—(i) *General.* Both runs of the manlift shall be illuminated at all times when the lift is in operation. An intensity of not less than 1-foot candle shall be maintained at all points. (However, see subparagraph (6)(iii) of this paragraph for illumination requirements at landings.)

(ii) *Control of illumination.* Lighting of manlift runways shall be by means of circuits permanently tied in to the building circuits (no switches), or shall be controlled by switches at each landing. Where separate switches are provided at each landing, any switch shall turn on all lights necessary to illuminate the entire runway.

(15) *Weather protection.* The entire manlift and its driving mechanism shall be protected from the weather at all times.

(c) *Mechanical requirements*—(1) *Machines, general.* (i) *Brake.* A mechanically applied, electrically released brake shall be applied to the motor shaft for direct-connected units or to the input shaft for belt-driven units. The brake shall be capable of stopping and holding the manlift when the descending side is loaded with 250 pounds on each step.

(ii) *Belt.* (*a*) The belts shall be of hard-woven canvas, rubber-coated canvas, leather, or other material meeting the strength requirements of paragraph (b)(3) of this section and having a coefficient of friction such that when used in conjunction with an adequate tension device it will meet the brake test specified in subdivision (i) of this subparagraph.

(*b*) The width of the belt shall be not less than 12 inches for a travel not exceeding 100 feet, not less than 14 inches for a travel greater than 100 feet but not exceeding 150 feet and 16 inches for a travel exceeding 150 feet.

(*c*) A belt that has become torn while in use on a manlift shall not be spliced and put back in service.

(2) *Speed*—(i) *Maximum speed.* No manlift designed for a speed in excess of 80 feet per minute shall be installed.

(3) *Platforms or steps*—(i) *Minimum depth.* Steps or platforms shall be not less than 12 inches nor more than 14 inches deep, measured from the belt to the edge of the step or platform.

(ii) *Width.* The width of the step or platform shall be not less than the width of the belt to which it is attached.

(iii) *Distance between steps.* The distance between steps shall be equally spaced and not less than 16 feet measured from the upper surface of one step to the upper surface of the next step above it.

(iv) *Angle of step.* The surface of the step shall make approximately a right angle with the "up" and "down" run of the belt, and shall travel in the approximate horizontal position with the "up" and "down" run of the belt.

(v) *Surfaces.* The upper or working surfaces of the step shall be of a material having inherent nonslip characteristics (coefficient of friction not less than 0.5) or shall be covered completely by a nonslip tread securely fastened to it.

(vi) *Strength of step supports.* When subjected to a load of 400 pounds applied at the approximate center of the step, step frames, or supports and their guides shall be of adequate strength to:

(*a*) Prevent the disengagement of any step roller.

(*b*) Prevent any appreciable misalinement.

(*c*) Prevent any visible deformation of the steps or its support.

(vii) *Prohibition of steps without handholds.* No steps shall be provided unless there is a corresponding handhold above or below it meeting the requirements of subparagraph (4) of this paragraph. If a step is removed for repairs or permanently, the handholds immediately above and below it shall be removed before the lift is again placed in service.

(4) *Handholds*—(i) *Location.* Handholds attached to the belt shall be provided and installed so that they are not less than 4 feet nor more than 4 feet 8 inches above the step tread. These shall be so located as to be available on the both "up" and "down" run of the belt.

(ii) *Size.* The grab surface of the handhold shall be not less than 4½ inches in width, not less than 3 inches in depth, and shall provide 2 inches of clearance from the belt. Fastenings for handholds shall be located not less than 1 inch from the edge of the belt.

(iii) *Strength.* The handhold shall be capable of withstanding, without damage, a load of 300 pounds applied parallel to the run of the belt.

(iv) *Prohibition of handhold without steps.* No handhold shall be provided without a corresponding step. If a handhold is removed permanently or temporarily, the corresponding step and handhold for the opposite direction of travel shall also be removed before the lift is again placed in service.

(v) *Type.* All handholds shall be of the closed type.

(5) *Up limit stops*—(i) *Requirements.* Two separate automatic stop devices shall be provided to cut off the power and apply the brake when a loaded step passes the upper terminal landing. One of these shall consist of a split-rail switch mechanically operated by the step roller and located not more than 6 inches above the top terminal landing. The second automatic stop device may consist of any of the following:

(*a*) Any split-rail switch placed 6 inches above and on the side opposite the first limit switch.

(*b*) An electronic device.

(*c*) A switch actuated by a lever, rod, or plate, the latter to be placed on the "up" side of the head pulley so as to just clear a passing step.

(ii) *Manual reset location.* After the manlift has been stopped by a stop device it shall be necessary to reset the automatic stop manually. The device shall be so located that a person resetting it shall have a clear view of both the "up" and "down" runs of the manlift. It shall not be possible to reset the device from any step or platform.

(iii) *Cut-off point.* The initial limit stop device shall function so that the manlift will be stopped before the loaded step has reached a point 24 inches above the top terminal landing.

(iv) *Electrical requirements.* (*a*) Where such switches open the main motor circuit directly they shall be of the multipole type.

(*b*) Where electronic devices are used they shall be so designed and installed that failure will result in shutting off the power to the driving motor.

(*c*) Where flammable vapors or dusts may be present all electrical installations shall be in accordance with the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968), requirements for such locations.

(*d*) Unless of the oil-immersed type controller contacts carrying the main motor current shall be copper to carbon or equal, except where the circuit is broken at two or more points simultaneously.

(6) *Emergency Stop*—(i) *General.* An emergency stop means shall be provided.

(ii) *Location.* This stop means shall be within easy reach of the ascending and descending runs of the belt.

(iii) *Operation.* This stop means shall be so connected with the control lever or operating mechanism that it will cut off the power and apply the brake when pulled in the direction of travel.

(iv) *Rope.* If rope is used, it shall be not less than three-eighths inch in diameter. Wire rope, unless marlin-covered, shall not be used.

(7) *Instruction and warning signs*—(i) *Instruction signs at landings or belts.* Signs of conspicuous and easily read style giving instructions for the use of the manlift shall be posted at each landing or stenciled on the belt.

(*a*) Such signs shall be of letters not less than 1 inch in height and of a color having high contrast with the surface on which it is stenciled or painted (white or yellow on black or black on white or gray).

(*b*) The instructions shall read approximately as follows:

Face the Belt.
Use the Handholds.
To Stop—Pull Rope.

(ii) *Top floor warning sign and light.* (*a*) At the top floor an illuminated sign shall be displayed bearing the following wording:

"TOP FLOOR—GET OFF"

Signs shall be in block letters not less than 2 inches in height. This sign shall be located within easy view of an ascending passenger and not more than 2 feet above the top terminal landing.

(*b*) In addition to the sign required by subdivision (*a*) of this subdivision, a red warning light of not less than 40-watt rating shall be provided immediately below the upper landing terminal and so located as to shine in the passenger's face.

(iii) *Visitor Warning.* A conspicuous sign having the following legend—AUTHORIZED PERSONNEL ONLY—shall be displayed at each landing. The sign shall be of block letters not less than 2 inches in height and shall be of a color offering high contrast with the background color.

(d) *Operating rules*—(1) *Proper use of manlifts.* No freight, packaged goods, pipe, lumber, or construction materials of any kind shall be handled on any manlift.

(e) *Periodic inspection*—(1) *Frequency.* All manlifts shall be inspected by a competent designated person at intervals of not more than 30 days. Limit switches shall be checked weekly. Manlifts found to be unsafe shall not be operated until properly repaired.

(2) *Items covered.* This periodic inspection shall cover but is not limited to the following items:

Steps.
Step Fastenings.
Rails.
Rail Supports and Fastenings.
Rollers and Slides.
Belt and Belt Tension.
Handholds and Fastenings.
Floor Landings.
Guardrails.
Lubrication.
Limit Switches.
Warning Signs and Lights.
Illumination.
Drive Pulley.
Bottom (boot) Pulley and Clearance.
Pulley Supports.
Motor.
Driving Mechanism.
Brake.
Electrical Switches.
Vibration and Misalignment.
"Skip" on up or down run when mounting step (indicating worn gears).

(3) *Inspection log.* A written record shall be kept of findings at each inspection. Records of inspection shall be made available to the Assistant Secretary of Labor or his duly authorized representative.

(SOURCE: ANSI A90.1–1969 Safety Code for Manlifts.)

§ 1910.69 Sources of standards.

Sec.	*Source*
1910.66	ANSI A120.1–1970 Safety Code for Powered Platforms for Exterior Building Maintenance.
1910.67	ANSI A92.2–1969. American National Standard for Vehicle-Mounted Elevating and Rotating Work Platforms.
1910.68	ANSI A90.1–1969 Safety Code for Manlifts.

§ 1910.70 Standards organizations.

Specific standards of the following organizations have been referenced in this subpart. Copies of the standards may be obtained from the issuing organization.

American National Standards Institute, 1430 Broadway, New York, NY 10018.

Subpart G—Occupational Health and Environmental Control

§ 1910.93 Air contaminants.

An employee's exposure to any material listed in table G–1, G–2, or G–3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

(a) Table G–1:

(1) *Materials with names preceded by "C"—Ceiling Values.* An employee's exposure to any material in table G–1, the name of which is preceded by a "C" (e.g., C Boron trifluoride), shall at no time exceed the ceiling value given for that material in the table.

(2) *Other materials—8-hour time weighted averages.* An employee's exposure to any material in table G–1, the name of which is not preceded by "C", in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average given for that material in the table.

(b) Table G–2:

(1) *8-hour time weighted averages.* An employee's exposure to any material listed in table G–2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

(2) *Acceptable ceiling concentrations.* An employee's exposure to a material listed in table G–2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the material in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift".

(3) *Example.* During an 8-hour work shift, an employee may be exposed to a concentration of Benzene above 25 p.p.m. (but never above 50 p.p.m.) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 p.p.m. so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 p.p.m.

(c) Table G–3: An employee's exposure to any material listed in table G–3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

(d) Computation formulae:

(1) (i) The cumulative exposure for an 8-hour work shift shall be computed as follows:

$$E=\frac{C_aT_a+C_bT_b+\ .\ .\ .\ C_nT_n}{8}$$

where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time *T* where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of *E* shall not exceed the 8-hour time weighted average limit in table

G–1, G–2, or G–3 for the material involved.

(ii) To illustrate the formula prescribed in subdivision (i) of this subparagraph, note that isoamyl acetate has an 8-hour time weighted average limit of 100 p.p.m. (table G–1). Assume that an employee is subject to the following exposure:

Two hours exposure at 150 p.p.m.
Two hours exposure at 75 p.p.m.
Four hours exposure at 50 p.p.m.

Substituting this information in the formula, we have

$$\frac{2\times150+2\times75+4\times50}{8}=81.25\text{ p.p.m.}$$

Since 81.25 p.p.m. is less than 100 p.p.m., the 8-hour time weighted average limit, the exposure is acceptable.

(2) (i) In case of a mixture of air contaminants an employer shall compute the equivalent exposure as follows:

$$E_m=\frac{C_1}{L_1}+\frac{C_2}{L_2}+\ldots\frac{C_n}{L_n}$$

Where:

E_m is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that contaminant, from table G–1, G–2, or G–3.

The value of E_m shall not exceed unity (1).

(ii) To illustrate the formula prescribed in subdivision (i) of this subparagraph, consider the following exposures:

Material	Actual concentration of 8-hour exposure	8-hour time weighted average exposure limit
Acetone (Table G–1)	500 p.p.m.	1,000 p.p.m.
2-Butanone (Table G–1)	45 p.p.m.	200 p.p.m.
Toluene (Table G–2)	40 p.p.m.	200 p.p.m.

Substituting in the formula, we have:

$$E_m=\frac{500}{1{,}000}+\frac{45}{200}+\frac{40}{200}$$
$$E_m=0.500+0.225+0.200$$
$$E_m=0.925$$

Since E_m is less than unity (1), the exposure combination is within acceptable limits.

(e) To achieve compliance with paragraph (a) through (d) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with § 1910.134.

TABLE G–1

Substance	p.p.m.[a]	mg./M^3[b]
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	20
Acetone	1,000	2,400
Acetonitrile	40	70
Acetylene dichloride, see 1, 2-Dichloroethylene		
Acetylene tetrabromide	1	14
Acrolein	0.1	0.25
Acrylamide—Skin		0.3
Acrylonitrile—Skin	20	45
Aldrin—Skin		0.25
Allyl alcohol—Skin	2	5
Allyl chloride	1	3
**C Allylglycidyl ether (AGE)	10	45
Allyl propyl disulfide	2	12
2-Aminoethanol, see Ethanolamine		
2-Aminopyridine	0.5	2
**Ammonia	50	35
Ammonium sulfamate (Ammate)		15
n-Amyl acetate	100	525
sec-Amyl acetate	125	650
Aniline—Skin	5	19
Anisidine (o, p-isomers)—Skin		0.5
Antimony and compounds (as Sb)		0.5
ANTU (alpha naphthyl thiourea)		0.3
Arsenic and compounds (as As)		0.5
Arsine	0.05	0.2
Azinphos-methyl—Skin		0.2
Barium (soluble compounds)		0.5
p-Benzoquinone, see Quinone		
Benzoyl peroxide		5
Benzyl chloride	1	5
Biphenyl, see Diphenyl		
Bisphenol A, see Diglycidyl ether		
Boron oxide		15
C Boron trifluoride	1	3
Bromine	0.1	0.7
Bromoform—Skin	0.5	5
Butadiene (1, 3-butadiene)	1,000	2,200
Butanethiol, see Butyl mercaptan		
2-Butanone	200	590
2-Butoxy ethanol (Butyl Cellosolve)—Skin	50	240
Butyl acetate (n-butyl acetate)	150	710
sec-Butyl acetate	200	950
tert-Butyl acetate	200	950
Butyl alcohol	100	300
sec-Butyl alcohol	150	450
tert-Butyl alcohol	100	300
C Butylamine—Skin	5	15
C tert-Butyl chromate (as CrO_3)—Skin		0.1
n-Butyl glycidyl ether (BGE)	50	270
*Butyl mercaptan	10	35
p-tert-Butyltoluene	10	60
Calcium arsenate		1
Calcium oxide		5
**Camphor	2	
Carbaryl (Sevin ®)		5
Carbon black		3.5
Carbon dioxide	5,000	9,000
Carbon monoxide	50	55
Chlordane—Skin		0.5
Chlorinated camphene—Skin		0.5
Chlorinated diphenyl oxide		0.5
*Chlorine	1	3
Chlorine dioxide	0.1	0.3
C Chlorine trifluoride	0.1	0.4
C Chloroacetaldehyde	1	3
α-Chloroacetophenone (phenacylchloride)	0.05	0.3
Chlorobenzene (monochlorobenzene)	75	350
o-Chlorobenzylidene malononitrile (OCBM)	0.05	0.4
Chlorobromomethane	200	1,050
2-Chloro-1,3-butadiene, see Chloroprene		
Chlorodiphenyl (42 percent Chlorine)—Skin		1
Chlorodiphenyl (54 percent Chlorine)—Skin		0.5
1-Chloro,2,3-epoxypropane, see Epichlorhydrin		
2-Chloroethanol, see Ethylene chlorohydrin		
Chloroethylene, see Vinyl chloride		
C Chloroform (trichloromethane)	50	240
1-Chloro-1-nitropropane	20	100
Chloropicrin	0.1	0.7
Chloroprene (2-chloro-1,3-butadiene)—Skin	25	90
Chromium, sol. chromic, chromous salts as Cr		0.5
Metal and insol. salts		1
Coal tar pitch volatiles (benzene soluble fraction) anthracene, BaP, phenanthrene, acridine, chrysene, pyrene		0.2
Cobalt, metal fume and dust		0.1
Copper fume		0.1
Dusts and Mists		1
Cotton dust (raw)		1
Crag® herbicide		15
Cresol (all isomers)—Skin	5	22
Crotonaldehyde	2	6
Cumene—Skin	50	245
Cyanide (as CN)—Skin		5
Cyclohexane	300	1,050
Cyclohexanol	50	200
Cyclohexanone	50	200
Cyclohexene	300	1,015
Cyclopentadiene	75	200
2, 4-D		10
DDT—Skin		1
DDVP, see Dichlorvos		
Decaborane—Skin	0.05	0.3
Demeton®—Skin		0.1
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	50	240
1,2-diaminoethane, see Ethylenediamine		
Diazomethane	0.2	0.4
Diborane	0.1	0.1
Dibutylphthalate		5
C o-Dichlorobenzene	50	300
p-Dichlorobenzene	75	450
Dichlorodifluoromethane	1,000	4,950
1,3-Dichloro-5,5-dimethyl hydantoin		0.2
1,1-Dichloroethane	100	400
1,2-Dichloroethylene	200	790
C Dichloroethyl ether—Skin	15	90
Dichloromethane, see Methylenechloride		
Dichloromonofluoromethane	1,000	4,200
C 1,1-Dichloro-1-nitroethane	10	60
1,2-Dichloropropane, see Propylenedichloride		
Dichlorotetrafluoroethane	1,000	7,000
Dichlorvos (DDVP)—Skin		1
Dieldrin—Skin		0.25
Diethylamine	25	75
Diethylamino ethanol—Skin	10	50
Diethylether, see Ethyl ether		
Difluorodibromomethane	100	860
C Diglycidyl ether (DGE)	0.5	2.8
Dihydroxybenzene, see Hydroquinone		
Diisobutyl ketone	50	290
Diisopropylamine—Skin	5	20
Dimethoxymethane, see Methylal		
Dimethyl acetamide—Skin	10	35
Dimethylamine	10	18
Dimethylaminobenzene, see Xylidene		
Dimethylaniline(N-dimethylaniline)—Skin	5	25
Dimethylbenzene, see Xylene		
Dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate, (Dibrom)		3
Dimethylformamide—Skin	10	30
2,6-Dimethylheptanone, see Diisobutyl ketone		
1,1-Dimethylhydrazine—Skin	0.5	1
Dimethylphthalate		5
Dimethylsulfate—Skin	1	5
Dinitrobenzene (all isomers)—Skin		1
Dinitro-o-cresol—Skin		0.2
Dinitrotoluene—Skin		1.5
Dioxane (Diethylene dioxide)—Skin	100	360
Diphenyl	0.2	1
Diphenylmethane diisocyanate (see Methylene bisphenyl isocyanate (MDI)		
Dipropylene glycol methyl ether—Skin	100	600
Di-sec, octyl phthalate (Di-2-ethylhexylphthalate)		5
Endrin—Skin		0.1
Epichlorhydrin—Skin	5	19
EPN—Skin		0.5
1,2-Epoxypropane, see Propyleneoxide		
2,3-Epoxy-1-propanol, see Glycidol		

See footnotes at end of table.

TABLE G-1—Continued

Substance	p.p.m.[a]	mg./M^3 [b]
Ethanethiol, see Ethylmercaptan		
Ethanolamine	3	6
2-Ethoxyethanol—Skin	200	740
2-Ethoxyethylacetate (Cellosolve acetate)—Skin	100	540
Ethyl acetate	400	1,400
Ethyl acrylate—Skin	25	100
Ethyl alcohol (ethanol)	1,000	1,900
Ethylamine	10	18
Ethyl sec-amyl ketone (5-methyl-3-heptanone)	25	130
Ethyl benzene	100	435
Ethyl bromide	200	890
Ethyl butyl ketone (3-Heptanone)	50	230
Ethyl chloride	1,000	2,600
Ethyl ether	400	1,200
Ethyl formate	100	300
C Ethyl mercaptan	10	25
Ethyl silicate	100	850
Ethylene chlorohydrin—Skin	5	16
Ethylenediamine	10	25
Ethylene dibromide, see 1,2-Dibromoethane		
Ethylene dichloride, see 1,2-Dichloroethane		
C Ethylene glycol dinitrate and/or Nitroglycerin—Skin	[d]0.2	1
Ethylene glycol monomethyl ether acetate, see Methyl cellosolve acetate		
Ethylene imine—Skin	0.5	1
Ethylene oxide	50	90
Ethylidine chloride, see 1,1-Dichloroethane		
N-Ethylmorpholine—Skin	20	94
Ferbam		15
Ferrovanadium dust		1
Fluoride (as F)		2.5
Fluorine	0.1	0.2
Fluorotrichloromethane	1,000	5,600
Formic acid	5	9
Furfural—Skin	5	20
Furfuryl alcohol	50	200
Glycidol (2,3-Epoxy-1-propanol)	50	150
Glycol monoethyl ether, see 2-Ethoxyethanol		
Guthion ®, see Azinphos-methyl		
Hafnium		0.5
Heptachlor—Skin		0.5
Heptane (n-heptane)	500	2,000
Hexachloroethane—Skin	1	10
Hexachloronaphthalene—Skin		0.2
Hexane (n-hexane)	500	1,800
2-Hexanone	100	410
Hexone (Methyl isobutyl ketone)	100	410
sec-Hexyl acetate	50	300
Hydrazine—Skin	1	1.3
Hydrogen bromide	3	10
C Hydrogen chloride	5	7
Hydrogen cyanide—Skin	10	11
Hydrogen peroxide (90%)	1	1.4
Hydrogen selenide	0.05	0.2
Hydroquinone		2
C Iodine	0.1	1
Iron oxide fume		10
Isoamyl acetate	100	525
Isoamyl alcohol	100	360
Isobutyl acetate	150	700
Isobutyl alcohol	100	300
Isophorone	25	140
Isopropyl acetate	250	950
Isopropyl alcohol	400	980
Isopropylamine	5	12
Isopropylether	500	2,100
Isopropyl glycidyl ether (IGE)	50	240
Ketene	0.5	0.9
Lead arsenate		0.15
Lindane—Skin		0.5
Lithium hydride		0.025
L.P.G. (liquified petroleum gas)	1,000	1,800
Magnesium oxide fume		15
Malathion—Skin		15
Maleic anhydride	0.25	1
C Manganese		5
Mesityl oxide	25	100
Methanethiol, see Methyl mercaptan		
Methoxychlor		15
2-Methoxyethanol, see Methyl cellosolve		
Methyl acetate	200	610
Methyl acetylene (propyne)	1,000	1,650
Methyl acetylene-propadiene mixture (MAPP)	1,000	1,800
Methyl acrylate—Skin	10	35
Methylal (dimethoxymethane)	1,000	3,100
Methyl alcohol (methanol)	200	260
Methylamine	10	12
Methyl amyl alcohol, see Methyl isobutyl carbinol		
Methyl (n-amyl) ketone (2-Heptanone)	100	465
C Methyl bromide—Skin	20	80
Methyl butyl ketone, see 2-Hexanone		
Methyl cellosolve—Skin	25	80
Methyl cellosolve acetate—Skin	25	120
Methyl chloroform	350	1,900
Methylcyclohexane	500	2,000
Methylcyclohexanol	100	470
o-Methylcyclohexanone—Skin	100	460
Methyl ethyl ketone (MEK), see 2-Butanone		
Methyl formate	100	250
Methyl iodide—Skin	5	28
Methyl isobutyl carbinol—Skin	25	100
Methyl isobutyl ketone, see Hexone		
Methyl isocyanate—Skin	0.02	0.05
C Methyl mercaptan	10	20
Methyl methacrylate	100	410
Methyl propyl ketone, see 2-Pentanone		
C α Methyl styrene	100	480
C Methylene bisphenyl isocyanate (MDI)	0.02	0.2
Molybdenum:		
Soluble compounds		5
Insoluble compounds		15
Monomethyl aniline—Skin	2	9
C Monomethyl hydrazine—Skin	0.2	0.35
Morpholine—Skin	20	70
Naphtha (coaltar)	100	400
Naphthalene	10	50
Nickel carbonyl	0.001	0.007
Nickel, metal and soluble cmpds, as Ni		1
Nicotine—Skin		0.5
Nitric acid	2	5
Nitric oxide	25	30
p-Nitroaniline—Skin	1	6
Nitrobenzene—Skin	1	5
p-Nitrochlorobenzene—Skin		1
Nitroethane	100	310
Nitrogen dioxide	5	9
Nitrogen trifluoride	10	29
Nitroglycerin—Skin	0.2	2
Nitromethane	100	250
1-Nitropropane	25	90
2-Nitropropane	25	90
Nitrotoluene—Skin	5	30
Nitrotrichloromethane, see Chloropicrin		
Octachloronaphthalene—Skin		0.1
*Octane	500	2,350
*Oil mist, mineral		[e]5
Osmium tetroxide		0.002
Oxalic acid		1
Oxygen difluoride	0.05	0.1
Ozone	0.1	0.2
Paraquat—Skin		0.5
Parathion—Skin		0.1[f]
Pentaborane	0.005	0.01
Pentachloronaphthalene—Skin		0.5
Pentachlorophenol—Skin		0.5
*Pentane	1,000	2,950
2-Pentanone	200	700
Perchloromethyl mercaptan	0.1	0.8
Perchloryl fluoride	3	13.5
Petroleum distillates (naphtha)	500	2,000
Phenol—Skin	5	19
p-Phenylene diamine—Skin		0.1
Phenyl ether (vapor)	1	7
Phenyl ether-biphenyl mixture (vapor)	1	7
Phenylethylene, see Styrene		
Phenyl glycidyl ether (PGE)	10	60
Phenylhydrazine—Skin	5	22
Phosdrin (Mevinphos ®)—Skin		0.1
Phosgene (carbonyl chloride)	0.1	0.4
Phosphine	0.3	0.4
Phosphoric acid		1
Phosphorus (yellow)		0.1
Phosphorus pentachloride		1
Phosphorus pentasulfide		1
Phosphorus trichloride	0.5	3
Phthalic anhydride	2	12
Picric acid—Skin		0.1
Pival ® (2-Pivalyl-1,3-indandione)		0.1
Platinum (Soluble Salts) as Pt		0.002
Propargyl alcohol—Skin	1	
Propane	1,000	1,800
n-Propyl acetate	200	840
Propyl alcohol	200	500
n-Propyl nitrate	25	110
Propylene dichloride	75	350
Propylene imine—Skin	2	5
Propylene oxide	100	240
Propyne, see Methylacetylene		
Pyrethrum		5
Pyridine	5	15
Quinone	0.1	0.4
RDX—Skin		1.5
Rhodium, Metal fume and dusts, as Rh		0.1
Soluble salts		0.001
Ronnel		10
Rotenone (commercial)		5
Selenium compounds (as Se)		0.2
Selenium hexafluoride	0.05	0.4
Silver, metal and soluble compounds		0.01
Sodium fluoroacetate (1080)—Skin		0.05
Sodium hydroxide		2
Stibine	0.1	0.5
*Stoddard solvent	500	2,950
Strychnine		0.15
Sulfur dioxide	5	13
Sulfur hexafluoride	1,000	6,000
Sulfuric acid		1
Sulfur monochloride	1	6
Sulfur pentafluoride	0.025	0.25
Sulfuryl fluoride	5	20
Systox, see Demeton ®		
2,4,5T		10
Tantalum		5
TEDP—Skin		0.2
Tellurium		0.1
Tellurium hexafluoride	0.02	0.2
TEPP—Skin		0.05
C Terphenyls	1	9
1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4,170
1,1,2,2-Tetrachloro-1,2-difluoroethane	500	4,170
1,1,2,2-Tetrachloroethane—Skin	5	35
Tetrachloroethylene, see Perchloroethylene		
Tetrachloromethane, see Carbon tetrachloride		
Tetrachloronaphthalene—Skin		2
Tetraethyl lead (as Pb)—Skin		0.075
Tetrahydrofuran	200	590
Tetramethyl lead (as Pb)—Skin		0.07
Tetramethyl succinonitrile—Skin	0.5	3
Tetranitromethane	1	8
Tetryl (2,4,6-trinitrophenylmethylnitramine)—Skin		1.5
Thallium (soluble compounds)—Skin as Tl		0.1
Thiram		5
Tin (inorganic cmpds, except oxides		2
Tin (organic cmpds)		0.1
C Toluene-2,4-diisocyanate	0.02	0.14
o-Toluidine—Skin	5	22
Toxaphene, see Chlorinated camphene		
Tributyl phosphate		5
1,1,1-Trichloroethane see Methyl chloroform		
1,1,2-Trichloroethane—Skin	10	45
Titaniumdioxide		15
Trichloromethane, see Chloroform		
Trichloronaphthalene—Skin		5
1,2,3-Trichloropropane	50	300
1,1,2-Trichloro 1,2,2-trifluoroethane	1,000	7,600
Triethylamine	25	100
Trifluoromonobromomethane	1,000	6,100
2,4,6-Trinitrophenol, see Picric acid		
2,4,6-Trinitrophenylmethylnitramine, see Tetryl		
Trinitrotoluene—Skin		1.5
Triorthocresyl phosphate		0.1
Triphenyl phosphate		3
Turpentine	100	560
Uranium (soluble compounds)		0.05
Uranium (insoluble compounds)		0.25
C Vanadium:		
V_2O_5 dust		0.5
V_2O_5 fume		0.1
Vinyl benzene, see Styrene		
**C Vinyl chloride	500	1,300
Vinylcyanide, see Acrylonitrile		
Vinyl toluene	100	480
Warfarin		0.1
Xylene (xylol)	100	435
Xylidine—Skin	5	25
Yttrium		1
Zinc chloride fume		1
Zinc oxide fume		5
Zirconium compounds (as Zr)		5

*1970 Addition.

[a] Parts of vapor or gas per million parts of contaminated air by volume at 25° C. and 760 mm. Hg pressure.

[b] Approximate milligrams of particulate per cubic meter of air.

(No footnote "c" is used to avoid confusion with ceiling value notations.)

[d] An atmospheric concentration of not more than 0.02 p.p.m., or personal protection may be necessary to avoid headache.

[e] As sampled by method that does not collect vapor.

[f] For control of general room air, biologic monitoring is essential for personnel control.

TABLE G-2

Material	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift.	
			Concentration	Maximum duration
Benzene (Z37.4-1969)	10 p.p.m	25 p.p.m	50 p.p.m	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970).	2 μg./M^3	5 μg./M^3	25 μg./M^3	30 minutes.
Cadmium fume (Z37.5-1970)	0.1 mg./M^3	3 mg./M^3		
Cadmium dust (Z37.5-1970)	0.2 mg./M^3	0.6 mg./M^3		
Carbon disulfide (Z37.3-1968)	20 p.p.m	30 p.p.m	100 p.p.m	Do.
Carbon tetrachloride (Z37.17-1967)	10 p.p.m	25 p.p.m	200 p.p.m	5 minutes in any 4 hours.
Ethylene dibromide (Z37.31-1970)	20 p.p.m	30 p.p.m	50 p.p.m	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 p.p.m	100 p.p.m	200 p.p.m	5 minutes in any 3 hours.
Formaldehyde (Z37.16-1967)	3 p.p.m	5 p.p.m	10 p.p.m	30 minutes.
Hydrogen fluoride (Z37.28-1969)	do			
Fluoride as dust (Z37.28-1969)	2.5 mg./M^3			
Lead and its inorganic compounds (Z37.11-1969).	0.2 mg./M^3			
Methyl chloride (Z37.18-1969)	100 p.p.m	200 p.p.m	300 p.p.m	5 minutes in any 3 hours.
Methylene Chloride (Z37.3-1969)	500 p.p.m	1,000 p.p.m	2,000 p.p.m	5 minutes in any 2 hours.
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg./M^3	0.04 mg./M^3		
Styrene (Z37.15-1969)	100 p.p.m	200 p.p.m	600 p.p.m	5 minutes in any 3 hours.
Trichloroethylene (Z37.19-1967)	do	do	300 p.p.m	5 minutes in any 2 hours.
Tetrachloroethylene (Z37.22-1967)	do	do	do	5 minutes in any 3 hours.
Toluene (Z37.12-1967)	200 p.p.m	300 p.p.m	500 p.p.m	10 minutes.
Hydrogen sulfide (Z37.2-1966)		20 p.p.m	50 p.p.m	10 minutes once only if no other measurable exposure occurs.
Mercury (Z37.8-1971)		1 mg./10M^3		
Chromic acid and chromates (Z37.7-1971)		do ^{3}		

TABLE G-3—MINERAL DUSTS

Substance	Mppcf [e]	Mg/M^3
Silica:		
Crystalline:		
Quartz (respirable)	$\frac{250}{\%SiO_2+5}$ [f]	$\frac{10mg/M^3}{\%SiO_2+2}$ [m]
Quartz (total dust)		$\frac{30mg/M^3}{\%S_2O_2+2}$
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	$\frac{80mg/M^3}{\%SiO_2}$
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (non-asbestos-form)	20 [n]	
Talc (fibrous). Use asbestos limit		
Tremolite (see talc, fibrous)		
Portland cement	50	
Graphite (natural)	15	
Coal dust (respirable fraction less than 5% SiO_2)		2.4mg/M^3 or
For more than 5% SiO_2		$\frac{10mg/M^3}{\%SiO_2+2}$
Inert or Nuisance Dust:		
Respirable fraction	15	5mg/M^3
Total dust	50	15mg/M^3

NOTE: Conversion factors—
mppcf×35.3=million particles per cubic meter
=particles per c.c.

[e] Millions of particles per cubic foot of air, based on impinger samples counted by light-field technics.

[f] The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

[j] As determined by the membrane filter method at 430×phase contrast magnification.

[m] Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

[n] Containing < 1% quartz; if > 1% quartz, use quartz limit.

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
3.5	50
5.0	25
10	0

The measurements under this note refer to the use of an AEC instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 Mg/M^3 in the table for coal dust is 4.5 Mg/M^3.

§ 1910.93a Asbestos.

(a) *Definitions.* For the purpose of this section, (1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(b) *Permissible exposure to airborne concentrations of asbestos fibers*—(1) *Standard effective July 7, 1972.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(2) *Standard effective July 1, 1976.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(3) *Ceiling concentration.* No employee shall be exposed at any time to airborne cencentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(c) *Methods of compliance*—(1) *Engineering methods.* (i) *Engineering controls.* Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.

(ii) *Local exhaust ventilation.* (*a*) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1971, which is incorporated by reference herein.

(*b*) See § 1910.6 concerning the availability of ANSI Z9.2-1971, and the maintenance of a historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(iii) *Particular tools.* All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with subdivision (ii) of this subparagraph.

(2) *Work practices*—(i) *Wet methods.* Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.

(ii) *Particular products and operations.* No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.

(iii) *Spraying, demolition, or removal.* Employees engaged in the spraying of asbestos, the removal, or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d)(2)(iii) of this section and with special clothing in accordance with paragraph (d)(3) of this section.

(d) *Personal protective equipment*—(1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the use of respirators or shift rotation of employees, except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;

(ii) In work situations in which the methods prescribed in paragraph (c) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by paragraph (b) of this section; or

(iii) In emergencies.

(iv) Where both respirators and personnel rotation are allowed by subdivisions (i), (ii), or (iii) of this subparagraph, and both are practicable, personnel rotation shall be preferred and used.

(2) Where a respirator is permitted by subparagraph (1) of this paragraph, it shall be selected from among those approved by the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, Department of Health, Education, and Welfare, under the provisions of 30 CFR Part 11 (37 F.R. 6244, Mar. 25, 1972), and shall be used in accordance with subdivisions (i), (ii), (iii), and (iv) of this subparagraph.

(i) *Air purifying respirators.* A reusable or single use air purifying respirator, or a respirator described in subdivision (ii) or (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

(ii) *Powered air purifying respirators.* A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in subdivision (iii) of this subparagraph, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.

(iii) *Type "C" supplied-air respirators, continuous flow or pressure-demand class.* A type "C" continuous flow or pressure-demand, supplied-air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.

(iv) *Establishment of a respirator program.* (*a*) The employer shall establish a respirator program in accordance with the requirements of the American National Standards Practices for Respiratory Protection, ANSI Z88.2–1969, which is incorporated by reference herein.

b. See § 1910.6 concerning the availability of ANSI Z88.2–1969 and the maintenance of an historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(c) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

(3) Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in paragraph (b) of this section.

(4) Change rooms: (i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, the employer shall provide change rooms for employees working regularly at the place.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

(iii) Laundering: (*a*) Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(*b*) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in (*a*) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(*c*) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph (g) of this section.

(e) *Method of measurement.* All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400–450 × (magnification) (4 millimeter objective) with phase contrast illumination.

(f) *Monitoring*—(1) *Initial determinations.* Within 6 months of the publication of this section, every employer shall cause every place of employment where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

(2) *Personal monitoring*—(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by paragraph (b) of this section.

(3) *Environmental monitoring*—(i) samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) *Sampling frequency and patterns.* After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in paragraph (b) of this section.

(4) *Employee observation of monitoring.* Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

(g) *Caution signs and labels.* (1) *Caution signs.* (i) *Posting.* Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in paragraph (b) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(ii) *Sign specifications.* The warning signs required by subdivision (i) of this subparagraph shall conform to the requirements of 20'' x 14'' vertical format signs specified in § 1910.145(d)(4), and to this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

Legend	*Notation*
Asbestos	1" Sans Serif, Gothic or Block.
Dust Hazard	¾" Sans Serif, Gothic or Block.
Avoid Breathing Dust	¼" Gothic.
Wear Assigned Protective Equipment.	¼" Gothic.
Do Not Remain In Area Unless Your Work Requires It.	¼" Gothic.
Breathing Asbestos Dust May Be Hazardous To Your Health.	14 point Gothic.

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(2) *Caution labels*—(i) *Labeling.* Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(ii) *Label specifications.* The caution labels required by subdivision (i) of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION

Contains Asbestos Fibers

Avoid Creating Dust

Breathing Asbestos Dust May Cause Serious Bodily Harm

(h) *Housekeeping*—(1) *Cleaning.* All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) *Waste disposal.* Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(i) *Recordkeeping*—(1) *Exposure records.* Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) *Employee access.* Every employee and former employee shall have reasonable access to any record required to be maintained by subparagraph (1) of this paragraph, which indicates the employee's own exposure to asbestos fibers.

(3) *Employee notification.* Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(j) *Medical examinations*—(1) *General.* The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) *Preplacement.* The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(3) *Annual examinations.* On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(4) *Termination of employment.* The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(5) *Recent examinations.* No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) *Medical records*—(i) *Maintenance.* Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least 20 years.

(ii) *Access.* The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, to authorized physicians and medical consultants of either of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

§ 1910.94 Ventilation.

(a) *Abrasive blasting*—(1) *Definitions applicable to this paragraph.*—(i) *Abrasive.* A solid substance used in an abrasive blasting operation.

(ii) *Abrasive-blasting respirator.* A continuous flow air-line respirator constructed so that it will cover the wearer's head, neck, and shoulders to protect him from rebounding abrasive.

(iii) *Blast cleaning barrel.* A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

(iv) *Blast cleaning room.* A complete enclosure in which blasting operations are performed and where the operator works inside of the room to operate the blasting nozzle and direct the flow of the abrasive material.

(v) *Blasting cabinet.* An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

(vi) *Clean air.* Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

(vii) *Dust collector.* A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

(viii) *Exhaust ventilation system.* A system for removing contaminated air from a space, comprising two or more of the following elements (*a*) enclosure or hood, (*b*) duct work, (*c*) dust collecting equipment, (*d*) exhauster, and (*e*) discharge stack.

(ix) *Particulate-filter respirator.* An air purifying respirator, commonly referred to as a dust or a fume respirator, which removes most of the dust or fume from the air passing through the device.

(x) *Respirable dust.* Airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages.

(xi) *Rotary blast cleaning table.* An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.

(xii) *Abrasive blasting.* The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

(2) *Dust hazards from abrasive blasting.* (i) Abrasives and the surface coatings on the materials blasted are shattered and pulverized during blasting

operations and the dust formed will contain particles of respirable size. The composition and toxicity of the dust from these sources shall be considered in making an evaluation of the potential health hazards.

(ii) The concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator or any other worker shall be kept below the levels specified in § 1910.93.

(iii) Organic abrasives which are combustible shall be used only in automatic systems. Where flammable or explosive dust mixtures may be present, the construction of the equipment, including the exhaust system and all electric wiring, shall conform to the requirements of American National Standard Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1–1961 (NFPA 91–1961), and the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968). The blast nozzle shall be bonded and grounded to prevent the build up of static charges. Where flammable or explosive dust mixtures may be present, the abrasive blasting enclosure, the ducts, and the dust collector shall be constructed with loose panels or explosion venting areas, located on sides away from any occupied area, to provide for pressure relief in case of explosion, following the principles set forth in the National Fire Protection Association Explosion Venting Guide. NFPA 68–1954.

(3) *Blast-cleaning enclosures.* (i) Blast-cleaning enclosures shall be exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure during the blasting operation.

(*a*) All air inlets and access openings shall be baffled or so arranged that by the combination of inward air flow and baffling the escape of abrasive or dust particules into an adjacent work area will be minimized and visible spurts of dust will not be observed.

(*b*) The rate of exhaust shall be sufficient to provide prompt clearance of the dust-laden air within the enclosure after the cessation of blasting.

(*c*) Before the enclosure is opened, the blast shall be turned off and the exhaust system shall be run for a sufficient period of time to remove the dusty air within the enclosure.

(*d*) Safety glass protected by screening shall be used in observation windows, where hard deep-cutting abrasives are used.

(*e*) Slit abrasive-resistant baffles shall be installed in multiple sets at all small access openings where dust might escape, and shall be inspected regularly and replaced when needed.

(*1*) Doors shall be flanged and tight when closed.

(*2*) Doors on blast-cleaning rooms shall be operable from both inside and outside, except that where there is a small operator access door, the large work access door may be closed or opened from the outside only.

(4) *Exhaust ventilation systems.* (i) The construction, installation, inspection, and maintenance of exhaust systems shall conform to the principles and requirements set forth in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960, and ANSI Z33.1–1961.

(*a*) When dust leaks are noted, repairs shall be made as soon as possible.

(*b*) The static pressure drop at the exhaust ducts leading from the equipment shall be checked when the installation is completed and periodically thereafter to assure continued satisfactory operation. Whenever an appreciable change in the pressure drop indicates a partial blockage, the system shall be cleaned and returned to normal operating condition.

(ii) In installations where the abrasive is recirculated, the exhaust ventilation system for the blasting enclosure shall not be relied upon for the removal of fines from the spent abrasive instead of an abrasive separator. An abrasive separator shall be provided for the purpose.

(iii) The air exhausted from blast-cleaning equipment shall be discharged through dust collecting equipment. Dust collectors shall be set up so that the accumulated dust can be emptied and removed without contaminating other working areas.

(5) *Personal protective equipment.* (i) Only respiratory protective equipment approved by the Bureau of Mines, U.S. Department of the Interior (see 30 CFR Part 11) shall be used for protection of personnel against dusts produced during abrasive-blasting operations.

(ii) Abrasive-blasting respirators shall be worn by all abrasive-blasting operators:

(*a*) When working inside of blast-cleaning rooms, or

(*b*) When using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure, or

(*c*) Where concentrations of toxic dust dispersed by the abrasive blasting may exceed the limits set in § 1910.93 and the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure.

(iii) Particulate filter respirators, commonly referred to as dust-filter respirators, properly fitted, may be used for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point, when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means. Respirators used shall be approved (see 30 CFR Part 11) for protection against the specific type of dust encountered.

(*a*) Dust-filter respirators may be used to protect the operator of outside abrasive-blasting operations where nonsilica abrasives are used on materials having low toxicities.

(*b*) Dust-filter respirators shall not be used for continuous protection where silica sand is used as the blasting abrasive, or toxic materials are blasted.

(iv) A respiratory protection program as defined and described in § 1910.134 (a) and (b), shall be established wherever it is necessary to use respiratory protective equipment.

(v) Operators shall be equipped with heavy canvas or leather gloves and aprons or equivalent protection to protect them from the impact of abrasives. Safety shoes shall be worn to protect against foot injury where heavy pieces of work are handled.

(*a*) Safety shoes shall conform to the requirements of American National Standard for Men's Safety-Toe Footwear, Z41.1–1967.

(*b*) Equipment for protection of the eyes and face shall be supplied to the operator when the respirator design does not provide such protection and to any other personnel working in the vicinity of abrasive blasting operations. This equipment shall conform to the requirements of § 1910.133.

(6) *Air supply and air compressors.* The air for abrasive-blasting respirators shall be free of harmful quantities of dusts, mists, or noxious gases, and shall meet the requirements for air purity set forth in ANSI Z9.2–1960. The air from the regular compressed air line of the plant may be used for the abrasive-blasting respirator if (i) a trap and carbon filter are installed and regularly maintained, to remove oil, water, scale, and odor, (ii) a pressure reducing diaphragm or valve is installed to reduce the pressure down to requirements of the particular type of abrasive-blasting respirator, and (iii) an automatic control is provided to either sound an alarm or shut down the compressor in case of overheating.

(7) *Operational procedures and general safety.* Dust shall not be permitted to accumulate on the floor or on ledges outside of an abrasive-blasting enclosure, and dust spills shall be cleaned up promptly. Aisles and walkways shall be kept clear of steel shot or similar abrasive which may create a slipping hazard.

(8) *Scope.* This paragraph (a) applies to all operations where an abrasive is forcibly applied to a surface by pneumatic or hydraulic pressure, or by centrifugal force. It does not apply to steam blasting, or steam cleaning, or hydraulic cleaning methods where work is done without the aid of abrasives.

(b) *Grinding, polishing, and buffing operations*—(1) *Definitions applicable to this paragraph*—(i) *Abrasive cutting-off wheels.* Organic-bonded wheels, the thickness of which is not more than one forty-eighth of their diameter for those up to, and including, 20 inches in diameter, and not more than one-sixtieth of their diameter for those larger than 20 inches in diameter, used for a multitude of operations variously known as cutting, cutting off, grooving, slotting, coping, and jointing, and the like. The wheels may be "solid" consisting of organic-bonded abrasive material throughout, "steel centered" consisting of a steel disc with a rim of organic-bonded material moulded around the periphery, or of the "inserted tooth" type consisting of a steel disc with organic-bonded abrasive teeth or inserts mechanically secured around the periphery.

(ii) *Belts.* All power-driven, flexible, coated bands used for grinding, polishing, or buffing purposes.

(iii) *Branch pipe.* The part of an exhaust system piping that is connected directly to the hood or enclosure.

(iv) *Cradle.* A movable fixture, upon which the part to be ground or polished is placed.

(v) *Disc wheels.* All power-driven rotatable discs faced with abrasive materials, artificial or natural, and used for grinding or polishing on the side of the assembled disc.

(vi) *Entry loss.* The loss in static pressure caused by air flowing into a duct or hood. It is usually expressed in inches of water gauge.

(vii) *Exhaust system.* A system consisting of branch pipes connected to hoods or enclosures, one or more header pipes, an exhaust fan, means for separating solid contaminants from the air flowing in the system, and a discharge stack to outside.

(viii) *Grinding wheels.* All power-driven rotatable grinding or abrasive wheels, except disc wheels as defined in this standard, consisting of abrasive particles held together by artificial or natural bonds and used for peripheral grinding.

(ix) *Header pipe (main pipe).* A pipe into which one or more branch pipes enter and which connects such branch pipes to the remainder of the exhaust system.

(x) *Hoods and enclosures.* The partial or complete enclosure around the wheel or disc through which air enters an exhaust system during operation.

(xi) *Horizontal double-spindle disc grinder.* A grinding machine carrying two power-driven, rotatable, coaxial, horizontal spindles upon the inside ends of which are mounted abrasive disc wheels used for grinding two surfaces simultaneously.

(xii) *Horizontal single-spindle disc grinder.* A grinding machine carrying an abrasive disc wheel upon one or both ends of a power-driven, rotatable single horizontal spindle.

(xiii) *Polishing and buffing wheels.* All power-driven rotatable wheels composed all or in part of textile fabrics, wood, felt, leather, paper, and may be coated with abrasives on the periphery of the wheel for purposes of polishing, buffing, and light grinding.

(xiv) *Portable grinder.* Any power-driven rotatable grinding, polishing, or buffing wheel mounted in such manner that it may be manually manipulated.

(xv) *Scratch brush wheels.* All power-driven rotatable wheels made from wire or bristles, and used for scratch cleaning and brushing purposes.

(xvi) *Swing-frame grinder.* Any power-driven rotatable grinding, polishing, or buffing wheel mounted in such a manner that the wheel with its supporting framework can be manipulated over stationary objects.

(xvii) *Velocity pressure (vp).* The kinetic pressure in the direction of flow necessary to cause a fluid at rest to flow at a given velocity. It is usually expressed in inches of water gage.

(xviii) *Vertical spindle disc grinder.* A grinding machine having a vertical, rotatable power-driven spindle carrying a horizontal abrasive disc wheel.

(2) *Application.* (i) Every establishment performing dry grinding, dry polishing, or buffing shall provide suitable hood or enclosures that are connected to exhaust systems.

(ii) Such exhaust systems shall be operated continuously whenever such operations are carried on, and be capable of preventing contaminants from entering the breathing zone.

(3) *Hood and branch pipe requirements.* (i) Hoods connected to exhaust systems shall be used, and such hoods shall be designed, located, and placed so that the dust or dirt particles shall fall or be projected into the hoods in the direction of the air flow. No wheels, discs, straps, or belts shall be operated in such manner and in such direction as to cause the dust and dirt particles to be thrown into the operator's breathing zone.

(ii) Grinding wheels on floor stands, pedestals, benches, and special-purpose grinding machines and abrasive cutting-off wheels shall have not less than the minimum exhaust volumes shown in Table G–4 with a recommended minimum duct velocity of 4,500 feet per minute in the branch and 3,500 feet per minute in the main. The entry losses from all hoods except the vertical-spindle disc grinder hood, shall equal 0.65 velocity pressure for a straight takeoff and 0.45 velocity pressure for a tapered takeoff. The entry loss for the vertical-spindle disc grinder hood is shown in figure G–1 (following § 1910.94(b)).
For any wheel wider than wheel diameters shown in Table G–4, increase the exhaust volume by the ratio of the new width to the width shown.

TABLE G–4—GRINDING AND ABRASIVE CUTTING-OFF WHEELS

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet³/min.)
To 9	1½	220
Over 9 to 16	2	390
Over 16 to 19	3	500
Over 19 to 24	4	610
Over 24 to 30	5	880
Over 30 to 36	6	1,200

Example:

If wheel width = 4½ inches, then

$$\frac{4.5}{4} \times 610 = 686 \text{ (rounded to 690).}$$

(iii) Scratch-brush wheels and all buffing and polishing wheels mounted on floor stands, pedestals, benches, or special-purpose machines shall have not less than the minimum exhaust volume shown in Table G–5.

TABLE G–5—BUFFING AND POLISHING WHEELS

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet³/min.)
To 9	2	300
Over 9 to 16	3	500
Over 16 to 19	4	610
Over 19 to 24	5	740
Over 24 to 30	6	1,040
Over 30 to 36	6	1,200

(iv) Grinding wheels or discs for horizontal single-spindle disc grinders shall be hooded to collect the dust or dirt generated by the grinding operation and the hoods shall be connected to branch pipes having exhaust volumes as shown in Table G–6.

TABLE G–6—HORIZONTAL SINGLE-SPINDLE DISC GRINDER

Disc diameter (inches):	*Exhaust volume* (*ft.³/min.*)
Up to 12	220
Over 12 to 19	390
Over 19 to 30	610
Over 30 to 36	880

(v) Grinding wheels or discs for horizontal double-spindle disc grinders shall have a hood enclosing the grinding chamber and the hood shall be connected to one or more branch pipes having exhaust volumes as shown in Table G–7.

TABLE G–7—HORIZONTAL DOUBLE-SPINDLE DISC GRINDER

Disc diameter (inches):	*Exhaust volume* (*ft.³/min.*)
Up to 19	610
Over 19 to 25	880
Over 25 to 30	1,200
Over 30 to 53	1,770
Over 53 to 72	6,280

(vi) Grinding wheels or discs for vertical single-spindle disc grinders shall be encircled with hoods to remove the dust generated in the operation. The hoods shall be connected to one or more branch pipes having exhaust volumes as shown in Table G–8.

TABLE G–8—VERTICAL SPINDLE DISC GRINDER

Disc diameter (inches)	One-half or more of disc covered		Disc not covered	
	Number[1]	Exhaust foot³/min.	Number[1]	Exhaust foot³/min.
Up to 20	1	500	2	780
Over 20 to 30	2	780	2	1,480
Over 30 to 53	2	1,770	4	3,530
Over 53 to 72	2	3,140	5	6,010

[1] Number of exhaust outlets around periphery of hood, or equal distribution provided by other means.

(vii) Grinding and polishing belts shall be provided with hoods to remove dust and dirt generated in the operations and the hoods shall be connected to branch pipes having exhaust volumes as shown in Table G–9.

TABLE G–9—GRINDING AND POLISHING BELTS

Belts width (inches):	*Exhaust volume* (*ft.³/min.*)
Up to 3	220
Over 3 to 5	300
Over 5 to 7	390
Over 7 to 9	500
Over 9 to 11	610
Over 11 to 13	740

(viii) Cradles and swing-frame grinders. Where cradles are used for handling the parts to be ground, polished, or buffed, requiring large partial enclosures to house the complete operation, a minimum average air velocity of 150 feet per minute shall be maintained over the entire opening of the enclosure. Swing-frame grinders shall also be exhausted in the same manner as provided for cradles. (See fig. G–3)

(ix) Where the work is outside the hood, air volumes must be increased as shown in American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960 (section 4, exhaust hoods).

(4) *Exhaust systems.* (i) Exhaust systems for grinding, polishing, and buffing operations should be designed in accordance with American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960.

(ii) Exhaust systems for grinding, polishing, and buffing operations shall be tested in the manner described in American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960.

(iii) All exhaust systems shall be provided with suitable dust collectors.

(5) *Hood and enclosure design.* (i) (*a*) It is the dual function of grinding and abrasive cutting-off wheel hoods to protect the operator from the hazards of bursting wheels as well as to provide a means for the removal of dust and dirt generated. All hoods shall be not less in structural strength than specified in the American National Standard Code for the Use, Care, and Protection of Abrasive Wheels, B7.1–1970.

(*b*) Due to the variety of work and types of grinding machines employed, it is necessary to develop hoods adaptable to the particular machine in question, and such hoods shall be located as close as possible to the operation.

(ii) Exhaust hoods for floor stands, pedestals, and bench grinders shall be designed in accordance with figure G–2. The adjustable tongue shown in the figure shall be kept in working order and shall be adjusted within one-fourth inch of the wheel periphery at all times.

(iii) Swing-frame grinders shall be provided with exhaust booths as indicated in figure G–3.

(iv) Portable grinding operations, whenever the nature of the work permits, shall be conducted within a partial enclosure. The opening in the enclosure shall be no larger than is actually required in the operation and an average face air velocity of not less than 200 feet per minute shall be maintained.

(v) Hoods for polishing and buffing and scratch-brush wheels shall be constructed to conform as closely to figure G–4 as the nature of the work will permit.

(vi) Cradle grinding and polishing operations shall be performed within a partial enclosure similar to figure G–5. The operator shall be positioned outside the working face of the opening of the enclosure. The face opening of the enclosure should not be any greater in area than that actually required for the performance of the operation and the average air velocity into the working face of the enclosure shall not be less than 150 feet per minute.

(vii) Hoods for horizontal single-spindle disc grinders shall be constructed to conform as closely as possible to the hood shown in figure G–6. It is essential that there be a space between the back of the wheel and the hood, and a space around the periphery of the wheel of at least 1 inch in order to permit the suction to act around the wheel periphery. The opening on the side of the disc shall be no larger than is required for the grinding operation, but must never be less than twice the area of the branch outlet.

(viii) Horizontal double-spindle disc grinders shall have a hood encircling the wheels and grinding chamber similar to that illustrated in figure G–7. The openings for passing the work into the grinding chamber should be kept as small as possible, but must never be less than twice the area of the branch outlets.

(ix) Vertical-spindle disc grinders shall be encircled with a hood so constructed that the heavy dust is drawn off a surface of the disc and the lighter dust exhausted through a continuous slot at the top of the hood as shown in figure G–1.

(x) Grinding and polishing belt hoods shall be constructed as close to the operation as possible. The hood should extend almost to the belt, and 1-inch wide openings should be provided on either side. Figure G–8 shows a typical hood for a belt operation.

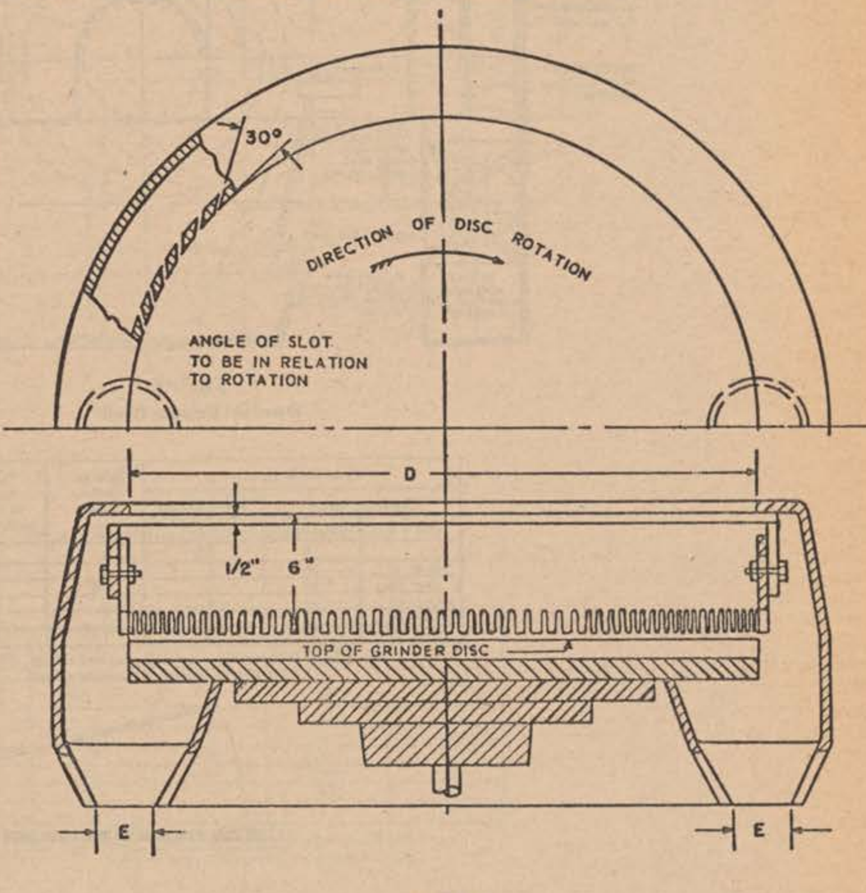

30°
DIRECTION OF DISC ROTATION
ANGLE OF SLOT TO BE IN RELATION TO ROTATION
D
1/2"
6"
TOP OF GRINDER DISC
E
E

Fig. G-1

Vertical Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections

Dia *D*, Inches		Exhaust *E*		Volume Exhausted at 4,500 ft/min ft³/min	Note
Min	Max	No. Pipes	Dia		
	20	1	4½	500	When one-half or more of the disc can be hooded, use exhaust ducts as shown at the left.
Over 20	30	2	4	780	
Over 30	72	2	6	1,770	
Over 53	72	2	8	3,140	
	20	2	4	780	When no hood can be used over disc, use exhaust ducts as shown at left.
Over 20	30	2	5½	1,480	
Over 30	53	4	6	3,530	
Over 53	72	5	7	6,010	

Entry loss = 1.0 slot velocity pressure + 0.5 branch velocity pressure
Minimum slot velocity = 2,000 ft/min – ½-inch slot width

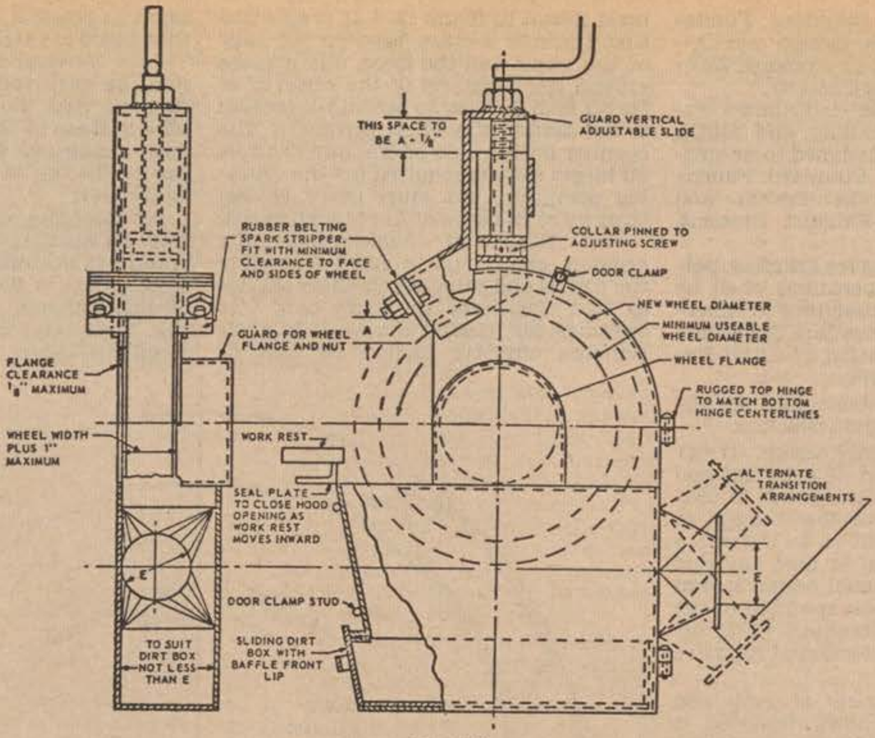

THIS SPACE TO BE A - 1/8"
GUARD VERTICAL ADJUSTABLE SLIDE
RUBBER BELTING SPARK STRIPPER. FIT WITH MINIMUM CLEARANCE TO FACE AND SIDES OF WHEEL
COLLAR PINNED TO ADJUSTING SCREW
DOOR CLAMP
NEW WHEEL DIAMETER
MINIMUM USEABLE WHEEL DIAMETER
A
GUARD FOR WHEEL FLANGE AND NUT
WHEEL FLANGE
FLANGE CLEARANCE 1/8" MAXIMUM
RUGGED TOP HINGE TO MATCH BOTTOM HINGE CENTERLINES
WHEEL WIDTH PLUS 1" MAXIMUM
WORK REST
ALTERNATE TRANSITION ARRANGEMENTS
SEAL PLATE TO CLOSE HOOD OPENING AS WORK REST MOVES INWARD
E
E
DOOR CLAMP STUD
SLIDING DIRT BOX WITH BAFFLE FRONT LIP
TO SUIT DIRT BOX NOT LESS THAN E

Fig. G-2
Standard Grinder Hood

Wheel Dimension			Exhaust Outlet, Inches	Volume of Air at 4,500 ft/min
Diameter, Inches		Width, Inches		
Min = d	Max = D	Max	E	
	9	1½	3	220
Over 9	16	2	4	390
Over 16	19	3	4½	500
Over 19	24	4	5	610
Over 24	30	5	6	880
Over 30	36	6	7	1,200

Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

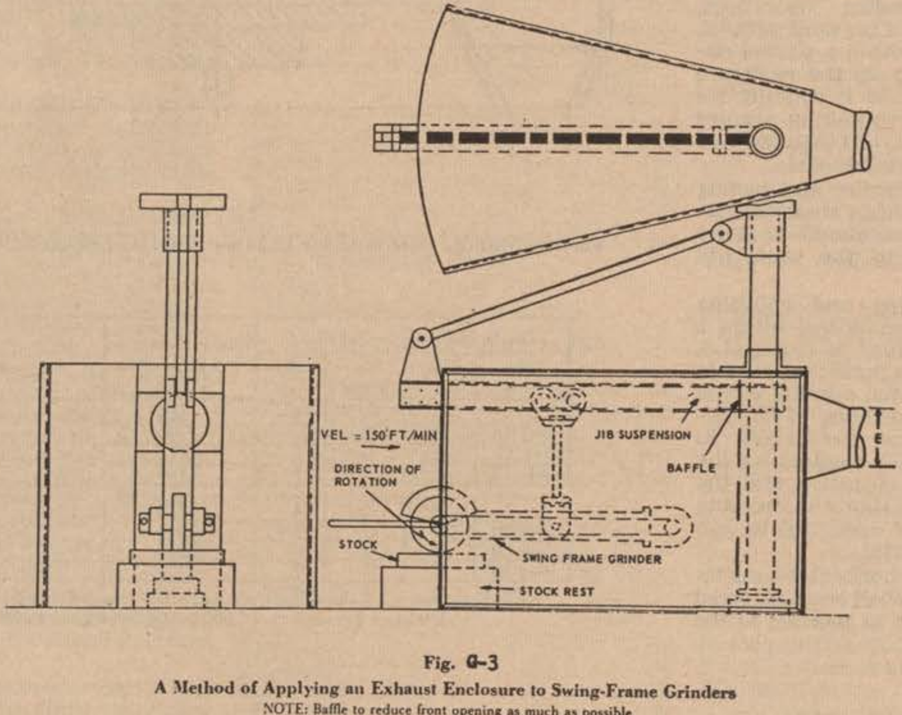


Fig. G-3
A Method of Applying an Exhaust Enclosure to Swing-Frame Grinders
NOTE: Baffle to reduce front opening as much as possible

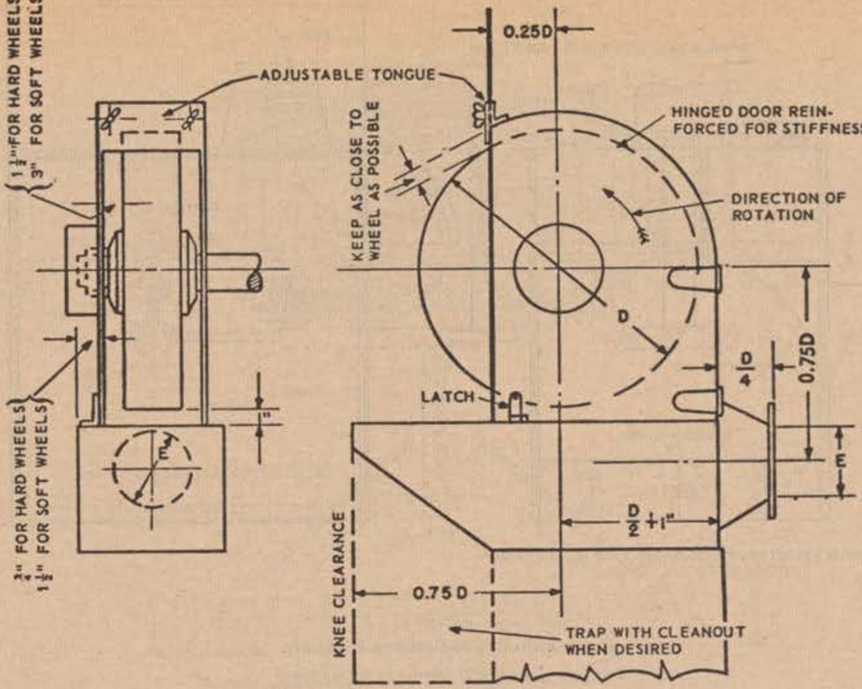
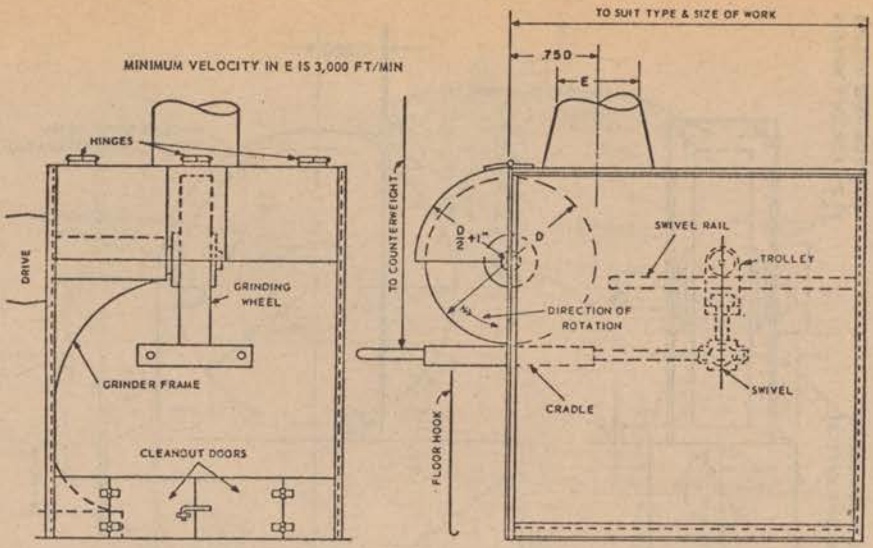


Fig. G-4
Standard Buffing and Polishing Hood

Wheel Dimension, Inches			Exhaust Outlet, Inches	Volume of Air at 4,500 ft/min
Diameter		Width		
Min = *d*	Max = *D*	Max	*E*	
	9	2	3½	300
Over 9	16	3	4	500
Over 16	19	4	5	610
Over 19	24	5	5½	740
Over 24	30	6	6½	1,040
Over 30	36	6	7	1,200

Entry loss = 0.15 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff



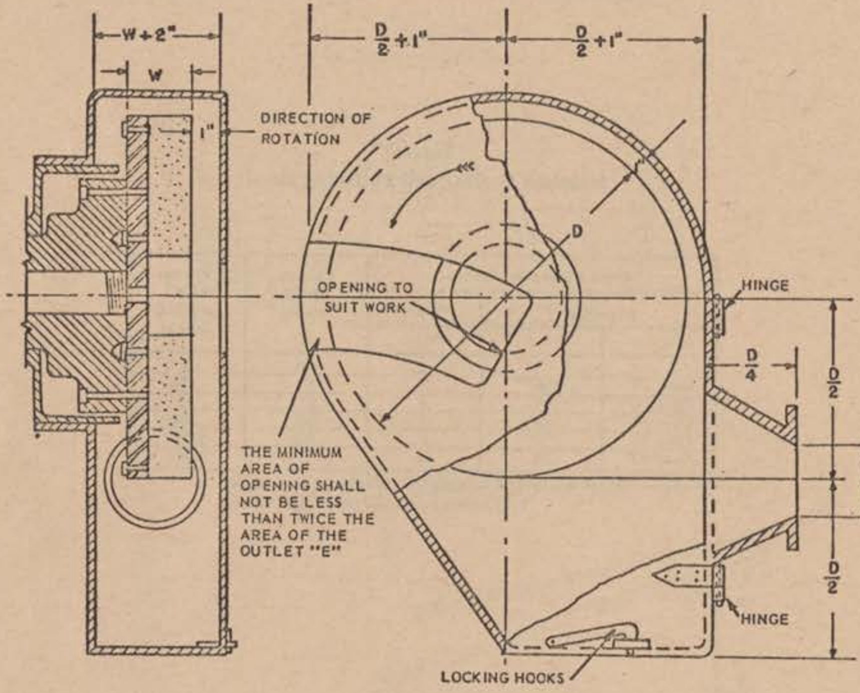
MINIMUM VELOCITY IN E IS 3,000 FT/MIN

MINIMUM VELOCITY AT ENCLOSURE FACE IS 150 FT/MIN

Fig. G-5

Cradle Polishing or Grinding Enclosure

Entry loss = 0.45 velocity pressure for tapered takeoff



THE MINIMUM AREA OF OPENING SHALL NOT BE LESS THAN TWICE THE AREA OF THE OUTLET "E"

Fig. G-6

Horizontal Single-Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections

Dia *D*. Inches		Exhaust *E*	Volume Exhausted at 4,500 ft/min ft³/min
Min	Max	Dia. Inches	
	12	3	220
Over 12	19	4	390
Over 19	30	5	610
Over 30	36	6	880

NOTE: If grinding wheels are used for disc grinding purposes, hoods must conform to structural strength and materials as described in 9.1.

Entry loss = 0.45 velocity pressure for tapered takeoff

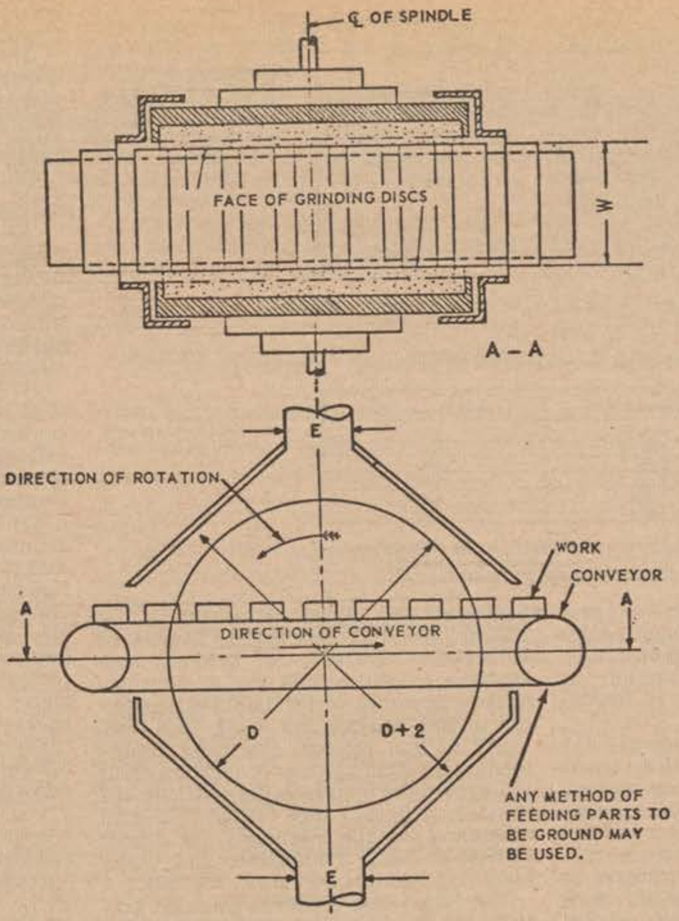


Fig. G-7

Horizontal Double-Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections

Disc Dia, Inches		Exhaust *E*		Volume Exhausted at 4.500 ft/min ft³/min	Note
Min	Max	No. Pipes	Dia		
	19	1	5	610	When width "W" permits, exhaust ducts should be as near heaviest grinding as possible.
Over 19	25	1	6	880	
Over 25	30	1	7	1.200	
Over 30	53	2	6	1.770	
Over 53	72	4	8	6.280	

Entry loss = 0.45 velocity pressure for tapered takeoff

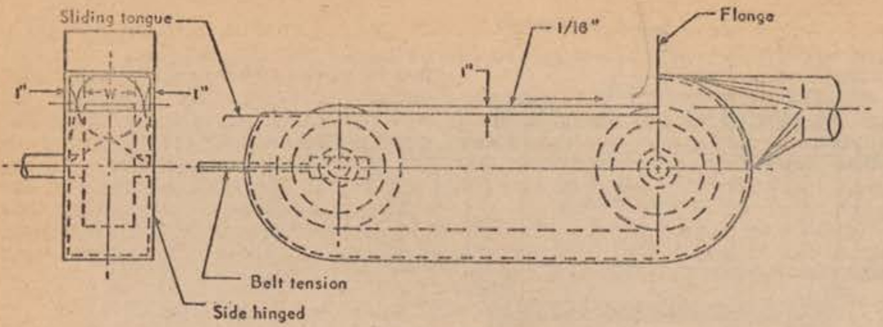


Fig. G-8

A Typical Hood for a Belt Operation

Belt Width W. Inches	Exhaust Volume, ft³/min
up to 3	220
3 to 5	300
5 to 7	390
7 to 9	500
9 to 11	610
11 to 13	740

Minimum duct velocity = 4.500 ft/min branch. 3.500 ft/min main
Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

(6) *Scope.* This paragraph (b), prescribes the use of exhaust hood enclosures and systems in removing dust, dirt, fumes, and gases generated through the grinding, polishing, or buffing of ferrous and nonferrous metals.

(c) *Spray-finishing operations*—(1) *Definitions applicable to this paragraph*—(i) *Spray-finishing operations.* Spray-finishing operations are employment of methods wherein organic or inorganic materials are utilized in dispersed form for deposit on surfaces to be coated, treated, or cleaned. Such methods of deposit may involve either automatic, manual, or electrostatic deposition but do not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems.

(ii) *Spray booth.* Spray booths are defined and described in § 1910.107(a). (See sections 103, 104, and 105 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969).

(iii) *Spray room.* A spray room is a room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas.

(iv) *Minimum maintained velocity.* Minimum maintained velocity is the velocity of air movement which must be maintained in order to meet minimum specified requirements for health and safety.

(2) *Location and application.* Spray booths or spray rooms are to be used to enclose or confine all operations. Spray-finishing operations shall be located as provided in sections 201 through 206 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969.

(3) *Design and construction of spray booths.* (i) Spray booths shall be designed and constructed in accordance with § 1910.107(b) (1)–(4) and (6)–(10) (see sections 301–304 and 306–310 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969), for general construction specifications. For a more detailed discussion of fundamentals relating to this subject, see ANSI Z9.2–1960.

(*a*) Lights, motors, electrical equipment, and other sources of ignition shall conform to the requirements of § 1910.107 (b)(10) and (c). (See section 310 and chapter 4 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969.)

(*b*) In no case shall combustible material be used in the construction of a spray booth and supply or exhaust duct connected to it.

(ii) Unobstructed walkways shall not be less than 6½ feet high and shall be maintained clear of obstruction from any work location in the booth to a booth exit or open booth front. In booths where the open front is the only exit, such exits shall be not less than 3 feet wide. In booths having multiple exits, such exits shall not be less than 2 feet wide, provided that the maximum distance from the work location to the exit is 25 feet or less. Where booth exits are provided with doors, such doors shall open outward from the booth.

(iii) Baffles, distribution plates, and dry-type overspray collectors shall conform to the requirements of § 1910.107 (b) (4) and (5). (See sections 304 and 305 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969.)

(*a*) Overspray filters shall be installed and maintained in accordance with the requirements of § 1910.107(b)(5), (see section 305 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33–1969), and shall only be in a location easily accessible for inspection, cleaning, or replacement.

(*b*) Where effective means, independent of the overspray filters, are installed which will result in design air distribution across the booth cross section, it is permissible to operate the booth without the filters in place.

(iv)(*a*) For wet or water-wash spray booths, the water-chamber enclosure, within which intimate contact of contaminated air and cleaning water or other cleaning medium is maintained, if made of steel, shall be 18 gage or heavier and adequately protected against corrosion.

(*b*) Chambers may include scrubber spray nozzles, headers, troughs, or other devices. Chambers shall be provided with adequate means for creating and maintaining scrubbing action for removal of particulate matter from the exhaust air stream.

(v) Collecting tanks shall be of welded steel construction or other suitable noncombustible material. If pits are used as collecting tanks, they shall be concrete, masonry, or other material having similar properties.

(*a*) Tanks shall be provided with weirs, skimmer plates, or screens to prevent sludge and floating paint from entering the pump suction box. Means for automatically maintaining the proper water level shall also be provided. Fresh water inlets shall not be submerged. They shall terminate at least one pipe diameter above the safety overflow level of the tank.

(*b*) Tanks shall be so constructed as to discourage accumulation of hazardous deposits.

(vi) Pump manifolds, risers, and headers shall be adequately sized to insure sufficient water flow to provide efficient operation of the water chamber.

(4) *Design and construction of spray rooms.* (i) Spray rooms, including floors, shall be constructed of masonry, concrete, or other noncombustible material.

(ii) Spray rooms shall have noncombustible fire doors and shutters.

(iii) Spray rooms shall be adequately ventilated so that the atmosphere in the breathing zone of the operator shall be maintained in accordance with the requirements of subparagraph (6)(ii) of this paragraph.

(iv) Spray rooms used for production spray-finishing operations shall conform to the requirements for spray booths.

(5) *Ventilation.* (i) Ventilation shall be provided in accordance with provisions of § 1910.107(d) (see chapter 5 of the Standard for Spray Finishing Using Flammable or Combustible Materials, NFPA No. 33–1969), and in accordance with the following:

(*a*) Where a fan plenum is used to equalize or control the distribution of exhaust air movement through the booth, it shall be of sufficient strength or rigidity to withstand the differential air pressure or other superficially imposed loads for which the equipment is designed and also to facilitate cleaning. Construction specifications shall be at least equivalent to those of subdivision (iii) of this subparagraph.

(*b*) All fan ratings shall be in accordance with Air Moving and Conditioning Association Standard Test Code for Testing Air Moving Devices, Bulletin 210, April 1962.

(ii) Inlet or supply ductwork used to transport makeup air to spray booths or surrounding areas shall be constructed of noncombustible materials.

(*a*) If negative pressure exists within inlet ductwork, all seams and joints shall be sealed if there is a possibility of infiltration of harmful quantities of noxious gases, fumes, or mists from areas through which ductwork passes.

(*b*) Inlet ductwork shall be sized in accordance with volume flow requirements and provide design air requirements at the spray booth.

(*c*) Inlet ductwork shall be adequately supported throughout its length to sustain at least its own weight plus any negative pressure which is exerted upon it under normal operating conditions.

(iii) Ducts shall be so constructed as to provide structural strength and stability at least equivalent to sheet steel of not less than the following thickness:

DIAMETER OR GREATER DIMENSION	(*U.S. gauge*)
Up to 8 inches inclusive	No. 24
Over 8 inches to 18 inches inclusive	No. 22
Over 18 inches to 30 inches inclusive	No. 20
Over 30 inches	No. 18

(*a*) Exhaust ductwork shall be adequately supported throughout its length to sustain its weight plus any normal accumulation in interior during normal operating conditions and any negative pressure exerted upon it.

(*b*) Exhaust ductwork shall be sized in accordance with good design practice which shall include consideration of fan capacity, length of duct, number of turns and elbows, variation in size, volume, and character of materials being exhausted. See American National Standard Z9.2–1960 for further details and explanation concerning elements of design.

(*c*) Longitudinal joints in sheet steel ductwork shall be either lock-seamed, riveted, or welded. For other than steel construction, equivalent securing of joints shall be provided.

(*d*) Circumferential joints in ductwork shall be substantially fastened together and lapped in the direction of airflow. At least every fourth joint shall be provided with connecting flanges, bolted together, or of equivalent fastening security.

(*e*) Inspection or clean-out doors shall be provided for every 9 to 12 feet of running length for ducts up to 12 inches in diameter, but the distance between clean-out doors may be greater for larger pipes. (See 8.3.21 of American National Standard Z9.1–1951.) A clean-out door or doors shall be provided for servicing the fan, and where necessary, a drain shall be provided.

(*f*) Where ductwork passes through a combustible roof or wall, the roof or wall shall be protected at the point of penetration by open space or fire-resistive material between the duct and the roof or wall. When ducts pass through firewalls, they shall be provided with automatic fire dampers on both sides of the wall, except that three-eighth-inch steel plates may be used in lieu of automatic fire dampers for ducts not exceeding 18 inches in diameter.

(*g*) Ductwork used for ventilating any process covered in this standard shall not be connected to ducts ventilating any other process or any chimney or flue used for conveying any products of combustion.

(6) *Velocity and air flow requirements.* (i) Except where a spray booth has an adequate air replacement system, the velocity of air into all openings of a spray booth shall be not less than that specified in Table G-10 for the operating conditions specified. An adequate air replacement system is one which introduces replacement air upstream or above the object being sprayed and is so designed that the velocity of air in the booth cross section is not less than that specified in Table G–10 when measured upstream or above the object being sprayed.

TABLE G-10—MINIMUM MAINTAINED VELOCITIES INTO SPRAY BOOTHS

Operating conditions for objects completely inside booth	Crossdraft, f.p.m.	Airflow velocities, f.p.m.	
		Design	Range
Electrostatic and automatic airless operation contained in booth without operator.	Negligible	50 large booth	50– 75
		100 small booth	75–125
Air-operated guns, manual or automatic	Up to 50	100 large booth	75–125
		150 small booth	125–175
Air-operated guns, manual or automatic	Up to 100	150 large booth	125–175
		200 small booth	150–250

NOTES:

(1) Attention is invited to the fact that the effectiveness of the spray booth is dependent upon the relationship of the depth of the booth to its height and width.

(2) Crossdrafts can be eliminated through proper design and such design should be sought. Crossdrafts in excess of 100 fpm (feet per minute) should not be permitted.

(3) Excessive air pressures result in loss of both efficiency and material waste in addition to creating a backlash that may carry overspray and fumes into adjacent work areas.

(4) Booths should be designed with velocities shown in the column headed "Design." However, booths operating with velocities shown in the column headed "Range" are in compliance with this standard.

(ii) In addition to the requirements in subdivision (i) of this subparagraph the total air volume exhausted through a spray booth shall be such as to dilute solvent vapor to at least 25 percent of the lower explosive limit of the solvent being sprayed. An example of the method of calculating this volume is given below.

Example: To determine the lower explosive limits of the most common solvents used in spray finishing, see Table G–11. Column 1 gives the number of cubic feet of vapor per gallon of solvent and column 2 gives the lower explosive limit (LEL) in percentage by volume of air. Note that the quantity of solvent will be diminished by the quantity of solids and nonflammables contained in the finish.

To determine the volume of air in cubic feet necessary to dilute the vapor from 1 gallon of solvent to 25 percent of the lower explosive limit, apply the following formula:

$$\text{Dilution volume required per gallon of solvent} = \frac{4\ (100\text{–LEL})\ (\text{cubic feet of vapor per gallon})}{\text{LEL}}$$

Using toluene as the solvent.

(1) LEL of toluene from Table G–11, column 2, is 1.4 percent.

(2) Cubic feet of vapor per gallon from Table G–11, column 1, is 30.4 cubic feet per gallon.

(3) Dilution volume required =

$$\frac{4\ (100-1.4)\ 30.4}{1.4} = 8{,}564 \text{ cubic feet.}$$

(4) To convert to cubic feet per minute of required ventilation, multiply the dilution volume required per gallon of solvent by the number of gallons of solvent evaporated per minute.

TABLE G–11—LOWER EXPLOSIVE LIMIT OF SOME COMMONLY USED SOLVENTS

Solvent	Cubic feet of vapor per gallon of liquid at 70° F	Lower explosive limit in percent by volume of air at 70° F
	Column 1	*Column 2*
Acetone	44.0	2.6
Amyl Acetate (iso)	21.6	[1] 1.0
Amyl Alcohol (n)	29.6	1.2
Amyl Alcohol (iso)	29.6	1.2
Benzene	36.8	[1] 1.4
Butyl Acetate (n)	24.8	1.7
Butyl Alcohol (n)	35.2	1.4
Butyl Cellosolve	24.8	1.1
Cellosolve	33.6	1.8
Cellosolve Acetate	23.2	1.7
Cyclohexanone	31.2	[1] 1.1
1,1 Dichloroethylene	42.4	5.6
1,2 Dichloroethylene	42.4	9.7
Ethyl Acetate	32.8	2.5
Ethyl Alcohol	55.2	4.3
Ethyl Lactate	28.0	[1] 1.5
Methyl Acetate	40.0	3.1
Methyl Alcohol	80.8	7.3
Methyl Cellosolve	40.8	2.5
Methyl Ethyl Ketone	36.0	1.8
Methyl n-Propyl Ketone	30.4	1.5
Naphtha (VM&P) (76° Naphtha)	22.4	0.9
Naphtha (100° Flash) Safety Solvent—Stoddard Solvent	23.2	1.1
Propyl Acetate (n)	27.2	2.0
Propyl Acetate (iso)	28.0	1.8
Propyl Alcohol (n)	44.8	2.1
Propyl Alcohol (iso)	44.0	2.0
Toluene	30.4	1.4
Turpentine	20.8	0.8
Xylene (o)	26.4	1.0

---

[1] At 212° F.

(iii) (*a*) When an operator must position himself in a booth downstream of the object being sprayed, an air supplied respirator or other type of respirator approved by the Bureau of Mines, U.S. Department of the Interior or specified in ANSI Z88.2–1969 for the material being sprayed should be used by the operator.

(*b*) Where downdraft booths are provided with doors, such doors shall be closed when spray painting.

(7) *Make-up air.* (i) Clean fresh air, free of contamination from adjacent industrial exhaust systems, chimneys, stacks, or vents, shall be supplied to a spray booth or room in quantities equal to the volume of air exhausted through the spray booth.

(ii) Where a spray booth or room receives make-up air through self-closing doors, dampers, or louvers, they shall be fully open at all times when the booth or room is in use for spraying. The velocity of air through such doors, dampers, or louvers shall not exceed 200 feet per minute. If the fan characteristics are such that the required air flow through the booth will be provided, higher velocities through the doors, dampers, or louvers may be used.

(iii) (*a*) Where the air supply to a spray booth or room is filtered, the fan static pressure shall be calculated on the assumption that the filters are dirty to the extent that they require cleaning or replacement.

(*b*) The rating of filters shall be governed by test data supplied by the manufacturer of the filter. A pressure gage shall be installed to show the pressure drop across the filters. This gage shall be marked to show the pressure drop at which the filters require cleaning or replacement. Filters shall be replaced or cleaned whenever the pressure drop across them becomes excessive or whenever the air flow through the face of the booth falls below that specified in Table G–10.

(iv) (*a*) Means for heating make-up air to any spray booth or room, before or at the time spraying is normally performed, shall be provided in all places where the outdoor temperature may be expected to remain below 55° F. for appreciable periods of time during the operation of the booth except where adequate and safe means of radiant heating for all operating personnel affected is provided. The replacement air during the heating seasons shall be maintained at not less than 65° F. at the point of entry into the spray booth or spray room. When otherwise unheated make-up air would be at a temperature of more than 10° F. below room temperature, its temperature shall be regulated as provided in section 3.6.3 of ANSI Z9.2–1960.

(*b*) As an alternative to an air replacement system complying with the preceding section, general heating of the building in which the spray room or booth is located may be employed provided that all occupied parts of the building are maintained at not less than 65° F. when the exhaust system is in operation or the general heating system supplemented by other sources of heat may be employed to meet this requirement.

(*c*) No means of heating make-up air shall be located in a spray booth.

(*d*) Where make-up air is heated by coal or oil, the products of combustion shall not be allowed to mix with the make-up air, and the products of combustion shall be conducted outside the building through a flue terminating at a point remote from all points where make-up air enters the building.

(*e*) Where make-up air is heated by gas, and the products of combustion are not mixed with the make-up air but are conducted through an independent flue to a point outside the building remote from all points where make-up air enters the building, it is not necessary to comply with (*f*) of this subdivision.

(*f*) Where make-up air to any manually operated spray booth or room is heated by gas and the products of combustion are allowed to mix with the supply air, the following precautions must be taken:

(*1*) The gas must have a distinctive and strong enough odor to warn workmen in a spray booth or room of its presence if in an unburned state in the make-up air.

(*2*) The maximum rate of gas supply to the make-up air heater burners must not exceed that which would yield in excess of 200 p.p.m. (parts per million) of carbon monoxide or 2,000 p.p.m. of total combustible gases in the mixture if the unburned gas upon the occurrence of flame failure were mixed with all of the make-up air supplied.

(*3*) A fan must be provided to deliver the mixture of heated air and products of combustion from the plenum chamber housing the gas burners to the spray booth or room.

(8) *Scope.* Spray booths or spray rooms are to be used to enclose or confine all spray finishing operations covered by this paragraph (c). This paragraph does not apply to the spraying of the exteriors of buildings, fixed tanks, or similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

(d) *Open surface tanks*—(1) *General.* (i) This paragraph applies to all operations involving the immersion of materials in liquids, or in the vapors of such liquids, for the purpose of cleaning or altering the surface or adding to or imparting a finish thereto or changing the character of the materials, and their subsequent removal from the liquid or vapor, draining, and drying. These operations include washing, electroplating, anodizing, pickling, quenching, dying, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations.

(ii) Except where specific construction specifications are prescribed in this section, hoods, ducts, elbows, fans, blowers, and all other exhaust system parts, components, and supports thereof shall be so constructed as to meet conditions of service and to facilitate maintenance and shall conform in construction to the specifications contained in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960.

(2) *Classification of open-surface tank operations.* (i) Open-surface tank operations shall be classified into 16 classes, numbered A–1 to D–4, inclusive.

(ii) *Determination of class.* Class is determined by two factors, hazard potential designated by a letter from A to D, inclusive, and rate of gas, vapor, or mist evolution designated by a number from 1 to 4, inclusive (for example, B.3).

(iii) Hazard potential is an index, on a scale of from A to D, inclusive, of the severity of the hazard associated with the substance contained in the tank because of the toxic, flammable, or explosive nature of the vapor, gas, or mist produced therefrom. The toxic hazard is determined from the concentration, measured in parts by volume of a gas or vapor, per million parts by volume of contaminated air (p.p.m.), or in milligrams of mist per cubic meter of air (mg./m.^{3}), below which ill effects are unlikely to occur to the exposed worker. The concentrations shall be those in § 1910.93.

(iv) The relative fire or explosion hazard is measured in degrees Fahrenheit in terms of the closed-cup flash point of the substance in the tank. Detailed information on the prevention of fire hazards in dip tanks may be found in Dip Tanks Containing Flammable or Combustible Liquids, NFPA No. 34–1966, National Fire Protection Association. Where the tank contains a mixture of liquids, other than organic solvents, whose effects are additive, the hygienic standard of the most toxic component (for example, the one having the lowest p.p.m. or mg./m.^{3}) shall be used, except where such substance constitutes an insignificantly small fraction of the mixture. For mixtures of organic solvents, their combined effect, rather than that of either individually, shall determine the hazard potential. In the absence of information to the contrary, the effects shall be considered as additive. If the sum of the ratios of the airborne concentration of each contaminant to the toxic concentration of that contaminant exceeds unity, the toxic concentration shall be considered to have been exceeded. (See Note A to subdivision (v) of this subparagraph.)

(v) Hazard potential shall be determined from Table G–12, with the value indicating greater hazard being used. When the hazardous material may be either a vapor with a threshhold limit value (*TLV*) in p.p.m. or a mist with a *TLV* in mg./m.^{3}, the *TLV* indicating the greater hazard shall be used (for example, A takes precedence over B or C; B over C; C over D).

NOTE A:

$$\frac{c_1}{TLV_1}+\frac{c_2}{TLV_2}+\frac{c_3}{TLV_3}+\ldots\frac{c_N}{TLV_N}>1$$

where:

c=Concentration measured at the operation in p.p.m.

TABLE G-12—DETERMINATION OF HAZARD POTENTIAL

Hazard potential	Toxicity Group		
	Gas or vapor (p.p.m.)	Mist (mg./m^3)	Flash point (in degrees F.)
A	0–10	0–0.1	
B	11–100	0.11–1.0	Under 100
C	101–500	1.1–10	100–200
D	Over 500	Over 10	Over 200

(vi) Rate of gas, vapor, or mist evolution is a numerical index, on a scale of from 1 to 4, inclusive, both of the relative capacity of the tank to produce gas, vapor, or mist and of the relative energy with which it is projected or carried upwards from the tank. Rate is evaluated in terms of

(*a*) The temperature of the liquid in the tank in degrees Fahrenheit;

(*b*) The number of degrees Fahrenheit that this temperature is below the boiling point of the liquid in degrees Fahrenheit;

(*c*) The relative evaporation of the liquid in still air at room temperature in an arbitrary scale—fast, medium, slow, or nil; and

(*d*) The extent that the tank gases or produces mist in an arbitrary scale—high, medium, low, and nil. (See Table G–13, Note 2.) Gassing depends upon electrochemical or mechanical processes, the effects of which have to be individually evaluated for each installation (see Table G–13, Note 3).

(vii) Rate of evolution shall be determined from Table G–13. When evaporation and gassing yield different rates, the lowest numerical value shall be used.

TABLE G–13—DETERMINATION OF RATE OF GAS, VAPOR, OR MIST EVOLUTION[1]

Rate	Liquid temperature,° F.	Degrees below boiling point	Relative evaporation[2]	Gassing[3]
1	Over 200	0–20	Fast	High.
2	150–200	21–50	Medium	Medium.
3	94–149	51–100	Slow	Low.
4	Under 94	Over 100	Nil	Nil.

NOTE 1. In certain classes of equipment, specifically vapor degreasers, an internal condenser or vapor level thermostat is used to prevent the vapor from leaving the tank during normal operation. In such cases, rate of vapor evolution from the tank into the workroom is not dependent upon the factors listed in the table, but rather upon abnormalities of operating procedure, such as carryout of vapors from excessively fast action, dragout of liquid by entrainment in parts, contamination of solvent by water and other materials, or improper heat balance. When operating procedure is excellent, effective rate of evolution may be taken as 4. When operating procedure is average, the effective rate of evolution may be taken as 3. When operation is poor, a rate of 2 or 1 is indicated, depending upon observed conditions.

NOTE 2. Relative evaporation rate is determined according to the methods described by A. K. Doolittle in Industrial and Engineering Chemistry, vol. 27, p. 1169, (3) where time for 100-percent evaporation is as follows: Fast: 0–3 hours; Medium: 3–12 hours; Slow: 12–50 hours; Nil: more than 50 hours.

NOTE 3. Gassing means the formation by chemical or electrochemical action of minute bubbles of gas under the surface of the liquid in the tank and is generally limited to aqueous solutions.

(3) *Ventilation.* Where ventilation is used to control potential exposures to workers as defined in subparagraph (2) (iii) of this paragraph, it shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation are discussed in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960.

(4) *Control requirements.* (i) Control velocities shall conform to Table G–14 in all cases where the flow of air past the breathing or working zone of the operator and into the hoods is undisturbed by local environmental conditions, such as open windows, wall fans, unit heaters, or moving machinery.

(ii) All tanks exhausted by means of hoods which

(*a*) Project over the entire tank;

(*b*) Are fixed in position in such a location that the head of the workman, in all his normal operating positions while working at the tank, is in front of all hood openings; and

(*c*) Are completely enclosed on at least two sides, shall be considered to be exhausted through an enclosing hood.

(*d*) The quantity of air in cubic feet per minute necessary to be exhausted through an enclosing hood shall be not less than the product of the control velocity times the net area of all openings in the enclosure through which air can flow into the hood.

TABLE G–14—CONTROL VELOCITIES IN FEET PER MINUTE (F.P.M.) FOR UNDISTURBED LOCATIONS

Class	Enclosing hood		Lateral exhaust[1]	Canopy hood[2]	
	One open side	Two open sides		Three open sides	Four open sides
A–1 and A–2	100	150	150	Do not use	Do not use
A–3 (Note 2), B–1, B–2, and C–1	75	100	100	125	175
B–3, C–2, and D–1 (Note 3)	65	90	75	100	150
A–4 (Note 2), C–3, and D–2 (Note 3)	50	75	50	75	125
B–4, C–4, D–3 (Note 3), and D–4	General room ventilation required.				

NOTES:
1. See Table G–15 for computation of ventilation rate.
2. Do not use canopy hood for Hazard Potential A processes.
3. Where complete control of hot water is desired, design as next highest class.

(iii) All tanks exhausted by means of hoods which do not project over the entire tank, and in which the direction of air movement into the hood or hoods is substantially horizontal, shall be considered to be laterally exhausted. The quantity of air in cubic feet per minute necessary to be laterally exhausted per square foot of tank area in order to maintain the required control velocity shall be determined from Table G–15 for all variations in ratio of tank width (*W*) to tank length (*L*). The total quantity of air in cubic feet per minute required to be exhausted per tank shall be not less than the product of the area of tank surface times the cubic feet per minute per square foot of tank area, determined from Table G–15.

(*a*) For lateral exhaust hoods over 42 inches wide, or where it is desirable to reduce the amount of air removed from the workroom, air supply slots or orifices shall be provided along the side or the center of the tank opposite from the exhaust slots. The design of such systems shall meet the following criteria:

(*1*) The supply air volume plus the entrained air shall not exceed 50 percent of the exhaust volume.

(*2*) The velocity of the supply airstream as it reaches the effective control area of the exhaust slot shall be less than the effective velocity over the exhaust slot area.

(*3*) The vertical height of the receiving exhaust hood, including any baffle, shall not be less than one-quarter the width of the tank.

(*4*) The supply airstream shall not be allowed to impinge on obstructions between it and the exhaust slot in such a manner as to significantly interfere with the performance of the exhaust hood.

TABLE G–15—MINIMUM VENTILATION RATE IN CUBIC FEET OF AIR PER MINUTE PER SQUARE FOOT OF TANK AREA FOR LATERAL EXHAUST

Required minimum control velocity, f.p.m. (from Table G–14)	C.f.m per sq. ft. to maintain required minimum velocities at following ratios (tank width (*W*) /tank length (*L*)).[1],[3]				
	0.0–0.09	0.1–0.24	0.25–0.49	0.5–0.99	1.0–2.0
Hood along one side or two parallel sides of tank when one hood is against a wall or baffle.[2] Also for a manifold along tank centerline.[3]					
50	50	60	75	90	100
75	75	90	110	130	150
100	100	125	150	175	200
150	150	190	225	260	300
Hood along one side or two parallel sides of free standing tank not against wall or baffle.					
50	75	90	100	110	125
75	110	130	150	170	190
100	150	175	200	225	250
150	225	260	300	340	375

[1] It is not practicable to ventilate across the long dimension of a tank whose ratio $\frac{W}{L}$ exceeds 2.0.

It is undesirable to do so when $\frac{W}{L}$ exceeds 1.0. For circular tanks with lateral exhaust along up to ½ the circumference, use $W/L=1.0$; for over one-half the circumference use $W/L=0.5$.

[2] Baffle is a vertical plate the same length as the tank, and with the top of the plate as high as the tank is wide. If the exhaust hood is on the side of a tank against a building wall or close to it, it is perfectly baffled.

[3] Use $\frac{W}{2}$ as tank width in computing when manifold is along centerline, or when hoods are used on two parallel sides of a tank.

Tank Width (*W*) means the effective width over which the hood must pull air to operate (for example, where the hood face is set back from the edge of the tank, this set back must be added in measuring tank width). The surface area of tanks can frequently be reduced and better control obtained (particularly on conveyorized systems) by using covers extending from the upper edges of the slots toward the center of the tank.

(5) Since most failure of push-pull systems result from excessive supply air volumes and pressures, methods of measuring and adjusting the supply air shall be provided. When satisfactory control has been achieved, the adjustable features of the hood shall be fixed so that they will not be altered.

(iv) All tanks exhausted by means of hoods which project over the entire tank, and which do not conform to the definition of enclosing hoods, shall be considered to be overhead canopy hoods. The quantity of air in cubic feet per minute necessary to be exhausted through a canopy hood shall be not less than the product of the control velocity times the net area of all openings between the bottom edges of the hood and the top edges of the tank.

(v) The rate of vapor evolution (including steam or products of combustion) from the process shall be estimated. If the rate of vapor evolution is equal to or greater than 10 percent of the calculated exhaust volume required, the exhaust volume shall be increased in equal amount.

(5) *Spray cleaning and degreasing.* Wherever spraying or other mechanical means are used to disperse a liquid above an open-surface tank, control must be provided for the airborne spray. Such operations shall be enclosed as completely as possible. The inward air velocity into the enclosure shall be sufficient to prevent the discharge of spray into the workroom. Mechanical baffles may be used to help prevent the discharge of spray. Spray painting operations are covered by paragraph (c) of this section.

(6) *Control means other than ventilation.* Tank covers, foams, beads, chips, or other materials floating on the tank surface so as to confine gases, mists, or vapors to the area under the cover or to the foam, bead, or chip layer; or surface tension depressive agents added to the liquid in the tank to minimize mist formation, or any combination thereof, may all be used as gas, mist, or vapor control means for open-surface tank operations, provided that they effectively reduce the concentrations of hazardous materials in the vicinity of the worker below the limits set in accordance with subparagraph (2) of this paragraph.

(7) *System design.* (i) The equipment for exhausting air shall have sufficient capacity to produce the flow of air required in each of the hoods and openings of the system.

(ii) The capacity required in subdivision (i) of this subparagraph shall be obtained when the airflow producing equipment is operating against the following pressure losses, the sum of which is the static pressure:

(*a*) Entrance losses into the hood.

(*b*) Resistance to airflow in branch pipe including bends and transformations.

(*c*) Entrance loss into the main pipe.

(*d*) Resistance to airflow in main pipe including bends and transformations.

(*e*) Resistance of mechanical equipment; that is, filters, washers, condensers, absorbers, etc., plus their entrance and exit losses.

(*f*) Resistance in outlet duct and discharge stack.

(iii) Two or more operations shall not be connected to the same exhaust system where either one or the combination of the substances removed may constitute a fire, explosion, or chemical reaction hazard in the duct system. Traps or other devices shall be provided to insure that condensate in ducts does not drain back into any tank.

(iv) The exhaust system, consisting of hoods, ducts, air mover, and discharge outlet, shall be designed in accordance with American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960, or the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists 1970. Airflow and pressure loss data provided by the manufacturer of any air cleaning device shall be included in the design calculations.

(8) *Operation.* (i) The required airflow shall be maintained at all times during which gas, mist, or vapor is emitted from the tank, and at all times the tank, the draining, or the drying area is in operation or use. When the system is first installed, the airflow from each hood shall be measured by means of a pitot traverse in the exhaust duct and corrective action taken if the flow is less than that required. When the proper flow is obtained, the hood static pressure shall be measured and recorded. At intervals of not more than 3 months operation, or after a prolonged shutdown period, the hoods and duct system shall be inspected for evidence of corrosion or damage. In any case where the airflow is found to be less than required, it shall be increased to the required value. (Information on airflow and static pressure measurement and calculations may be found in American National Standard Fundamental Governing the Design and Operation of Local Exhaust Systems, Z9.2–1960, or in the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists.)

(ii) The exhaust system shall discharge to the outer air in such a manner that the possibility of its effluent entering any building is at a minimum. Recirculation shall only be through a device for contaminant removal which will prevent the creation of a health hazard in the room or area to which the air is recirculated.

(iii) A volume of outside air in the range of 90 percent to 110 percent of the exhaust volume shall be provided to each room having exhaust hoods. The outside air supply shall enter the workroom in such a manner as not to be detrimental to any exhaust hood. The airflow of the makeup air system shall be measured on installation. Periodically, thereafter, the airflow should be remeasured, and corrective action shall be taken when the airflow is below that required. The makeup air shall be uncontaminated.

(9) *Personal protection.* (i) All employees working in and around open-surface tank operations must be instructed as to the hazards of their respective jobs, and in the personal protection and first aid procedures applicable to these hazards.

(ii) All persons required to work in such a manner that their feet may become wet shall be provided with rubber or other impervious boots or shoes, rubbers, or wooden-soled shoes sufficient to keep feet dry.

(iii) All persons required to handle work wet with a liquid other than water shall be provided with gloves impervious to such a liquid and of a length sufficient to prevent entrance of liquid into the tops of the gloves. The interior of gloves shall be kept free from corrosive or irritating contaminants.

(iv) All persons required to work in such a manner that their clothing may become wet shall be provided with such aprons, coats, jackets, sleeves, or other garments made of rubber, or of other materials impervious to liquids other than water, as are required to keep their clothing dry. Aprons shall extend well below the top of boots to prevent liquid splashing into the boots. Provision of dry, clean, cotton clothing along with rubber shoes or short boots and an apron impervious to liquids other than water shall be considered a satisfactory substitute where small parts are cleaned, plated, or acid dipped in open tanks and rapid work is required.

(v) Whenever there is a danger of splashing, for example, when additions are made manually to the tanks, or when acids and chemicals are removed from the tanks, the employees so engaged shall be required to wear either tight-fitting chemical goggles or an effective face shield. See § 1910.133.

(vi) When, during emergencies as described in subparagraph (11)(v) of this paragraph, workers must be in areas where concentrations of air contaminants are greater than the limit set by subparagraph (2)(ii) of this paragraph, or oxygen concentrations are less than 19.5 percent, they shall be required to wear respirators adequate to reduce their exposure to a level below these limits, or to provide adequate oxygen. Such respirators shall also be provided in marked, quickly accessible storage compartments built for the purpose, when there exists the possibility of accidental release of hazardous concentrations of air contaminants. Respirators shall be approved by the U.S. Bureau of Mines, U.S. Department of the Interior and shall be selected by a competent industrial hygienist or other technically qualified source. Respirators shall be used in accordance with § 1910.134, and persons who may require them shall be trained in their use.

(vii) Near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of clean cold water. The water pipe (carrying a pressure not exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than three-fourths inch, so that no time may be lost in washing off liquids from the skin or clothing. Alternatively, deluge showers and eye flushes shall be provided in cases where harmful chemicals may be splashed on parts of the body.

(viii) Operators with sores, burns, or other skin lesions requiring medical treatment shall not be allowed to work at their regular operations until so authorized by a physician. Any small skin abrasions, cuts, rash, or open sores which are found or reported shall be treated by a properly designated person so that chances of exposures to the chemicals are removed. Workers exposed to chromic acids shall have a periodic examination made of the nostrils and other parts of the body, to detect incipient ulceration.

(ix) Sufficient washing facilities, including soap, individual towels, and hot water, shall be provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin, on the basis of at least one basin (or its equivalent) with a hot water faucet for every 10 employees. See § 1910.141(d).

(x) Locker space or equivalent clothing storage facilities shall be provided to prevent contamination of street clothing.

(xi) First aid facilities specific to the hazards of the operations conducted shall be readily available.

(10) *Special precautions for cyanide.* Dikes or other arrangements shall be provided to prevent the possibility of intermixing of cyanide and acid in the event of tank rupture.

(11) *Inspection, maintenance, and installation.*

(i) Floors and platforms around tanks shall be prevented from becoming slippery both by original type of construction and by frequent flushing. They shall be firm, sound, and of the design and construction to minimize the possibility of tripping.

(ii) Before cleaning the interior of any tank, the contents shall be drained off, and the cleanout doors shall be opened where provided. All pockets in tanks or pits, where it is possible for hazardous vapors to collect, shall be ventilated and cleared of such vapors.

(iii) Tanks which have been drained to permit employees to enter for the purposes of cleaning, inspection, or maintenance may contain atmospheres which are hazardous to life or health, through the presence of flammable or toxic air contaminants, or through the absence of sufficient oxygen. Before employees shall be permitted to enter any such tank, appropriate tests of the atmosphere shall be made to determine if the limits set by subparagraph (2)(iii) of this paragraph are exceeded, or if the oxygen concentration is less than 19.5 percent.

(iv) If the tests made in accordance with subdivision (iii) of this subparagraph indicate that the atmosphere in the tank is unsafe, before any employee is permitted to enter the tank, the tank shall be ventilated until the hazardous atmosphere is removed, and ventilation shall be continued so as to prevent the occurrence of a hazardous atmosphere as long as an employee is in the tank.

(v) If, in emergencies, such as rescue work, it is necessary to enter a tank which may contain a hazardous atmosphere, suitable respirators, such as self-contained breathing apparatus; hose mask with blower, if there is a possibility of oxygen deficiency; or a gas mask, selected and operated in accordance with subparagraph (9)(vi) of this paragraph, shall be used. If a contaminant in the tank can cause dermatitis, or be absorbed through the skin, the employee entering the tank shall also wear protective clothing. At least one trained standby employee, with suitable respirator, shall be present in the nearest uncontaminated area. The standby employee must be able to communicate with the employee in the tank and be able to haul him out of the tank with a lifeline if necessary.

(vi) Maintenance work requiring welding or open flame, where toxic metal fumes such as cadmium, chromium, or lead may be evolved, shall be done only with sufficient local exhaust ventilation to prevent the creation of a health hazard, or be done with respirators selected and used in accordance with subparagraph (9)(vi) of this paragraph. Welding, or the use of open flames near any solvent cleaning equipment shall be permitted only after such equipment has first been thoroughly cleared of solvents and vapors.

(12) *Vapor degreasing tanks.* (i) In any vapor degreasing tank equipped with a condenser or vapor level thermostat, the condenser or thermostat shall keep the level of vapors below the top edge of the tank by a distance at least equal to one-half the tank width, or at least 36 inches, whichever is shorter.

(ii) Where gas is used as a fuel for heating vapor degreasing tanks, the combustion chamber shall be of tight construction, except for such openings as the exhaust flue, and those that are necessary for supplying air for combustion. Flues shall be of corrosion-resistant construction and shall extend to the outer air. If mechanical exhaust is used on this flue, a draft diverter shall be used. Special precautions must be taken to prevent solvent fumes from entering the combustion air of this or any other heater when chlorinated or fluorinated hydrocarbon solvents (for example, trichloroethylene, Freon) are used.

(iii) Heating elements shall be so designed and maintained that their surface temperature will not cause the solvent or mixture to decompose, break down, or be converted into an excessive quantity of vapor.

(iv) Tanks or machines of more than 4 square feet of vapor area, used for solvent cleaning or vapor degreasing, shall be equipped with suitable cleanout or sludge doors located near the bottom of each tank or still. These doors shall be so designed and gasketed that there will be no leakage of solvent when they are closed.

(13) *Scope.* (i) This paragraph (d) applies to all operations involving the immersion of materials in liquids, or in the vapors of such liquids, for the purpose of cleaning or altering their surfaces, or adding or imparting a finish thereto, or changing the character of the materials, and their subsequent removal from the liquids or vapors, draining, and drying. Such operations include washing, electroplating, anodizing, pickling, quenching, dyeing, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations, but do not include molten materials handling operations, or surface coating operations.

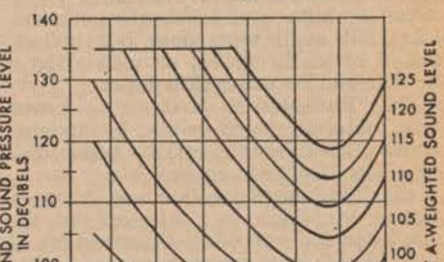
(ii) "Molten materials handling operations" means all operations, other than welding, burning, and soldering operations, involving the use, melting, smelting, or pouring of metals, alloys, salts, or other similar substances in the molten state. Such operations also include heat treating baths, descaling baths, die casting stereotyping, galvanizing, tinning, and similar operations.

(iii) "Surface coating operations" means all operations involving the application of protective, decorative, adhesive, or strengthening coating or impregnation to one or more surfaces, or into the interstices of any object or material, by means of spraying, spreading, flowing, brushing, roll coating, pouring, cementing, or similar means; and any subsequent draining or drying operations, excluding open-tank operations.

§ 1910.95 Occupational noise exposure.

(a) Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G–16 when measured on the A scale of a standard sound level meter at slow response. When noise levels are determined by octave band analysis, the equivalent A-weighted sound level may be determined as follows:

Figure G-9



Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table I.G-16.

(b)(1) When employees are subjected to sound exceeding those listed in Table

G–16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G–16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

(2) If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

(3) In all cases where the sound levels exceed the values shown herein, a continuing, effective hearing conservation program shall be administered.

Table G–16—Permissible Noise Exposures[1]

Duration per day, hours	*Sound level dBA slow response*
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

[1] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C1/T1+C2/T2 \quad Cn/Tn$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

§ 1910.96 Ionizing radiation.

(a) *Definitions applicable to this section.* (1) "Radiation" includes alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.

(2) "Radioactive material" means any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

(3) "Restricted area" means any area access to which is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(4) "Unrestricted area" means any area access to which is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(5) "Dose" means the quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units used in this section are set forth in subparagraphs (6) and (7) of this paragraph.

(6) "Rad" means a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad) = 0.001 rad).

(7) "Rem" means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 millirem (mrem) = 0.001 rem). The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions for irradiation. Each of the following is considered to be equivalent to a dose of 1 rem:

(i) A dose of 1 roentgen due to X- or gamma radiation;

(ii) A dose of 1 rad due to X-, gamma, or beta radiation;

(iii) A dose of 0.1 rad due to neutrons or high energy protons;

(iv) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

(v) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in subdivision (iii) of this subparagraph, 1 rem of neutron radiation may, for purposes of the provisions in this section be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there is sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to 1 rem may be estimated from Table G–17:

Table G–17—Neutron Flux Dose Equivalents

Neutron energy (million electron volts (Mev))	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm² per sec.)
Thermal	970×10^6	670
0.0001	720×10^6	500
0.005	820×10^6	570
0.02	400×10^6	280
0.1	120×10^6	80
0.5	43×10^6	30
1.0	26×10^6	18
2.5	29×10^6	20
5.0	26×10^6	18
7.5	24×10^6	17
10	24×10^6	17
10 to 30	14×10^6	10

(8) For determining exposures to X- or gamma rays up to 3 Mev., the dose limits specified in this section may be assumed to be equivalent to the "air dose". For the purpose of this section "air dose" means that the dose is measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dosage rate.

(b) *Exposure of individuals to radiation in restricted areas.* (1) Except as provided in subparagraph (2) of this paragraph, no employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table G–18:

Table G–18

	Rems per calendar quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1¼
Hands and forearms; feet and ankles	18¾
Skin of whole body	7½

(2) An employer may permit an individual in a restricted area to receive doses to the whole body greater than those permitted under subparagraph (1) of this paragraph, so long as:

(i) During any calendar quarter the dose to the whole body shall not exceed 3 rems; and

(ii) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N–18) rems, where "N" equals the individual's age in years at his last birthday; and

(iii) The employer maintains adequate past and current exposure records which show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subparagraph. As used in this subparagraph. "Dose to the whole body" shall be deemed to include any dose to the whole body, gonad, active bloodforming organs, head and trunk, or lens of the eye.

(3) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table G–18.

(4) "Calendar quarter" means any 3-month period determined as follows:

(i) The first period of any year may begin on any date in January: *Provided,* That the second, third, and fourth periods accordingly begin on the same date in April, July, and October, respectively, and that the fourth period extends into January of the succeeding year, if necessary to complete a 3-month quarter. During the first year of use of this method of determination, the first period for that year shall also include any additional days in January preceding the starting date for the first period; or

(ii) The first period in a calendar year of 13 complete, consecutive calendar weeks; the second period in a calendar year of 13 complete consecutive weeks; the third period in a calendar year of 13 complete, consecutive calendar weeks; the fourth period in a calendar year of 13 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of that year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of the previous year; or

(iii) The four periods in a calendar year may consist of the first 14 complete, consecutive calendar weeks; the next 12 complete, consecutive calendar weeks, the next 14 complete, consecutive calendar weeks, and the last 12 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete calendar week of the year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete week of the previous year.

(5) No employer shall change the method used by him to determine calendar quarters except at the beginning of a calendar year.

(c) *Exposure to airborne radioactive material.* (1) No employer shall possess, use or transport radioactive material in such a manner as to cause any employee, within a restricted area, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table 1 of Appendix B to 10 CFR Part 20. The limits given in Table 1 are for exposure to the concentrations specified for 40 hours in any workweek of 7 consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

(2) No employer shall possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table II of Appendix B to 10 CFR Part 20. For purposes of this subparagraph, concentrations may be averaged over periods not greater than 1 week.

(3) "Exposed" as used in this paragraph means that the individual is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size.

(d) *Precautionary procedures and personal monitoring.* (1) Every employer shall make such surveys as may be necessary for him to comply with the provisions in this section. "Survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

(2) Every employer shall supply appropriate personnel monitoring equipment, such as film badges, pocket chambers, pocket dosimeters, or film rings, to, and shall require the use of such equipment by:

(i) Each employee who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in paragraph (b)(1) of this section; and

(ii) Each employee under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in paragraph (b)(1) of this section; and

(iii) Each employee who enters a high radiation area.

(3) As used in this section:

(i) "Personnel monitoring equipment" means devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.);

(ii) "Radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem; and

(iii) "High radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

(e) *Caution signs, labels, and signals*—(1) *General.* (i) Symbols prescribed by this paragraph shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this paragraph is the conventional three-bladed design:

RADIATION SYMBOL

1. Cross-hatched area is to be magenta or purple.

2. Background is to be yellow.

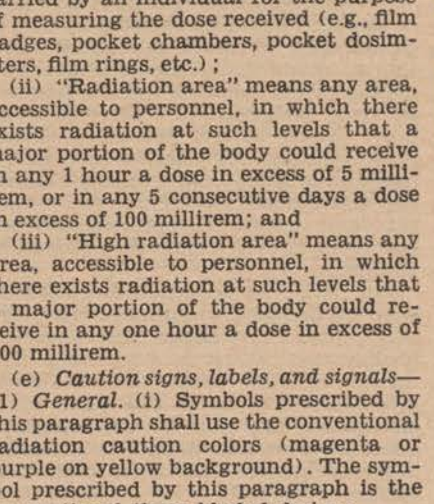


FIGURE G–10

(ii) In addition to the contents of signs and labels prescribed in this paragraph, employers may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material.

(2) *Radiation area.* Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
RADIATION AREA

(3) *High radiation area.* (i) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
HIGH RADIATION AREA

(ii) Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the employer or a supervisor of the activity are made aware of the entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.

(4) *Airborne radioactivity area.* (i) As used in the provisions of this section, "airborne radioactivity area" means:

(*a*) Any room, enclosure, or operating area in which airborne radioactive materials, composed wholly or partly of radioactive material, exist in concentrations in excess of the amounts specified in column 1 of Table 1 of Appendix B to 10 CFR Part 20 or

(*b*) Any room, enclosure, or operating area in which airborne radioactive materials exist in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25 percent of the amounts specified in column 1 of Table 1 of Appendix B to 10 CFR Part 20.

(ii) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
AIRBORNE RADIOACTIVITY AREA

(5) *Additional requirements.*

(i) Each area or room in which radioactive material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in any amount exceeding 10 times the quantity of such material specified in Appendix C to 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
RADIOACTIVE MATERIALS

(ii) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity of such material specified in 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
RADIOACTIVE MATERIALS

(6) *Containers.* (i) Each container in which is transported, stored, or used a quantity of any radioactive material (other than natural uranium or thorium) greater than the quantity of such material specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
RADIOACTIVE MATERIALS

(ii) Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION
RADIOACTIVE MATERIALS

(iii) Notwithstanding the provisions of subdivisions (i) and (ii) of this subparagraph a label shall not be required:

(*a*) If the concentration of the material in the container does not exceed that specified in column 2 of Table 1 of Appendix B to 10 CFR Part 20, or

(*b*) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.

(iv) Where containers are used for storage, the labels required in this subparagraph shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.

(f) *Immediate evacuation warning signal*—(1) *Signal characteristics.* (i) The signal shall be a midfrequency complex sound wave amplitude modulated at a subsonic frequency. The complex sound wave in free space shall have a fundamental frequency (f_1) between 450 and 500 hertz (Hz) modulated at a subsonic rate between 4 and 5 hertz.

(ii) The signal generator shall not be less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iii) A sufficient number of signal units shall be installed such that the requirements of subdivision (ii) of this subparagraph are met at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iv) The signal shall be unique in the plant or facility in which it is installed.

(v) The minimum duration of the signal shall be sufficient to insure that all affected persons hear the signal.

(vi) The signal-generating system shall respond automatically to an initiating event without requiring any human action to sound the signal.

(2) *Design objectives.* (i) The signal-generating system shall be designed to incorporate components which enable the system to produce the desired signal each time it is activated within one-half second of activation.

(ii) The signal-generating system shall be provided with an automatically activated secondary power supply which is adequate to simultaneously power all emergency equipment to which it is connected, if operation during power failure is necessary, except in those systems using batteries as the primary source of power.

(iii) All components of the signal-generating system shall be located to provide maximum practicable protection against damage in case of fire, explosion, corrosive atmosphere, or other environmental extremes consistent with adequate system performance.

(iv) The signal-generating system shall be designed with the minimum number of components necessary to make it function as intended, and should utilize components which do not require frequent servicing such as lubrication or cleaning.

(v) Where several activating devices feed activating information to a central signal generator, failure of any activating device shall not render the signal-generator system inoperable to activating information from the remaining devices.

(vi) The signal-generating system shall be designed to enhance the probability that alarm occurs only when immediate evacuation is warranted. The number of false alarms shall not be so great that the signal will come to be disregarded and shall be low enough to minimize personal injuries or excessive property damage that might result from such evacuation.

(3) *Testing.* (i) Initial tests, inspections, and checks of the signal-generating system shall be made to verify that the fabrication and installation were made in accordance with design plans and specifications and to develop a thorough knowledge of the performance of the system and all components under normal and hostile conditions.

(ii) Once the system has been placed in service, periodic tests, inspections, and checks shall be made to minimize the possibility of malfunction.

(iii) Following significant alterations or revisions to the system, tests and checks similar to the initial installation tests shall be made.

(iv) Tests shall be designed to minimize hazards while conducting the tests.

(v) Prior to normal operation the signal-generating system shall be checked physically and functionally to assure reliability and to demonstrate accuracy and performance. Specific tests shall include:

(*a*) All power sources.

(*b*) Calibration and calibration stability.

(*c*) Trip levels and stability.

(*d*) Continuity of function with loss and return of required services such as AC or DC power, air pressure, etc.

(*e*) All indicators.

(*f*) Trouble indicator circuits and signals, where used.

(*g*) Air pressure (if used).

(*h*) Determine that sound level of the signal is within the limit of subparagraph (1)(ii) of this paragraph at all points that require immediate evacuation.

(vi) In addition to the initial startup and operating tests, periodic scheduled performance tests and status checks must be made to insure that the system is at all times operating within design limits and capable of the required response. Specific periodic tests or checks or both shall include:

(*a*) Adequacy of signal activation device.

(*b*) All power sources.

(*c*) Function of all alarm circuits and trouble indicator circuits including trip levels.

(*d*) Air pressure (if used).

(*e*) Function of entire system including operation without power where required.

(*f*) Complete operational tests including sounding of the signal and determination that sound levels are adequate.

(vii) Periodic tests shall be scheduled on the basis of need, experience, difficulty, and disruption of operations. The entire system should be operationally tested at least quarterly.

(viii) All employees whose work may necessitate their presence in an area covered by the signal shall be made familiar with the actual sound of the signal—preferably as it sounds at their work location. Before placing the system into operation, all employees normally working in the area shall be made acquainted with the signal by actual demonstration at their work locations.

(g) *Exceptions from posting requirements.* Notwithstanding the provisions of paragraph (e) of this section:

(1) A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.

(2) Rooms or other areas in onsite medical facilities are not required to be posted with caution signs because of the presence of patients containing radioactive material, provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the provisions of this section.

(3) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours: *Provided,* That

(i) The materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the provisions of this section; and

(ii) Such area or room is subject to the employer's control.

(h) *Exemptions for radioactive materials packaged for shipment.* Radioactive materials packaged and labeled in accordance with regulations of the Department of Transportation published in 49 CFR Chapter I, are exempt from the labeling and posting requirements of this subpart during shipment, provided that the inside containers are labeled in accordance with the provisions of paragraph (e) of this section.

(i) *Instruction of personnel, posting.* (1) Employers regulated by the Atomic Energy Commission shall be governed by 10 CFR Part 20 standards. Employers in a State named in paragraph (p)(3) of this section shall be governed by the requirements of the laws and regulations of that State. All other employers shall be regulated by the following:

(2) All individuals working in or frequenting any portion of a radiation area shall be informed of the occurrence of radioactive materials or of radiation in such portions of the radiation area; shall be instructed in the safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure; shall be instructed in the applicable provisions of this section for the protection of employees from exposure to radiation or radioactive materials; and shall be advised of reports of radiation exposure which employees may request pursuant to the regulations in this section.

(3) Each employer to whom this section applies shall post a current copy of its provisions and a copy of the operating procedures applicable to the work conspicuously in such locations as to insure that employees working in or frequenting radiation areas will observe these documents on the way to and from their place of employment, or shall keep such documents available for examination of employees upon request.

(j) *Storage of radioactive materials.* Radioactive materials stored in a nonradiation area shall be secured against unauthorized removal from the place of storage.

(k) *Waste disposal.* No employer shall dispose of radioactive material except by transfer to an authorized recipient, or in a manner approved by the Atomic Energy Commission or a State named in paragraph (p)(3) of this section.

(l) *Notification of incidents*—(1) *Immediate notification.* Each employer shall immediately notify the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20; paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms of any individual to 375 rems or more of radiation; or

(ii) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limit specified for such materials in Table II of Appendix B to 10 CFR Part 20.

(iii) A loss of 1 working week or more of the operation of any facilities affected; or

(iv) Damage to property in excess of $100,000.

(2) *Twenty-four hour notification.* Each employer shall within 24 hours following its occurrence notify the Assistant Secretary of Labor or his duly authorized representative for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20; paragraph (p)(2) of this section, or the requirements of the laws and applicable regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) Exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation; or

(ii) A loss of 1 day or more of the operation of any facilities; or

(iii) Damage to property in excess of $10,000.

(m) *Reports of overexposure and excessive levels and concentrations.* (1) In addition to any notification required by paragraph (l) of this section each employer shall make a report in writing within 30 days to the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20; or under paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, of each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this section. Each report required under this subparagraph shall describe the extent of exposure of persons to radiation or to radioactive material; levels of radiation and concentration of radioactive material involved, the cause of the exposure, levels of concentrations; and corrective steps taken or planned to assure against a recurrence.

(2) In any case where an employer is required pursuant to the provisions of this paragraph to report to the U.S. Department of Labor any exposure of an individual to radiation or to concentrations of radioactive material, the employer shall also notify such individual of the nature and extent of exposure. Such notice shall be in writing and shall contain the following statement: "You should preserve this report for future reference."

(n) *Records.* (1) Every employer shall maintain records of the radiation exposure of all employees for whom personnel monitoring is required under paragraph (d) of this section and advise each of his employees of his individual exposure on at least an annual basis.

(2) Every employer shall maintain records in the same units used in tables in paragraph (b) of this section and Appendix B to 10 CFR Part 20.

(o) *Disclosure to former employee of individual employee's record.* (1) At the request of a former employee an employer shall furnish to the employee a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to paragraph (n)(1) of this section. Such report shall be furnished within 30 days from the time the request is made, and shall cover each calendar quarter of the individual's employment involving exposure to radiation or such lesser period as may be requested by the employee. The report shall also include the results of any calculations and analysis of radioactive material deposited in the body of the employee. The report shall be in writing and contain the following statement: "You should preserve this report for future reference."

(2) The former employee's request should include appropriate identifying data, such as social security number and dates and locations of employment.

(p) *Atomic Energy Commission licensees—AEC contractors operating AEC plants and facilities—AEC Agreement State licensees or registrants.* (1) Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended, under a license issued by the Atomic Energy Commission and in accordance with the requirements of 10 CFR Part 20 shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(2) AEC contractors operating AEC plants and facilities: Any employer who possesses or uses source material, byproduct material, special nuclear material, or other radiation sources under a contract with the Atomic Energy Commission for the operation of AEC plants and facilities and in accordance with the standards, procedures, and other requirements for radiation protection established by the Commission for such contract pursuant to the Atomic Energy Act of 1954 as amended (42 U.S.C. 2011 et seq.), shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(3) AEC-agreement State licensees or registrants:

(i) *Atomic Energy Act sources.* Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by, a State which has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, unless the Secretary of Labor, after conference with the Atomic Energy Commission, shall determine that the State's program for control of these radiation sources is incompatible with the requirements of this section. Such agreements currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.

(ii) *Other sources.* Any employer who possesses or uses radiation sources other than source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by a State which has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021 (b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, provided the State's program for control of these radiation sources is the subject of a currently effective determination by the Assistant Secretary of Labor that such program is compatible with the requirements of this section. Such determinations currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.

(q) [Reserved]

(r) *Radiation standards for mining.* (1) For the purpose of this paragraph, a "working level" is defined as any combination of radon daughters in 1 liter of air which will result in the ultimate emission of 1.3×10^5 million electron volts of potential alpha energy. The numerical value of the "working level" is derived from the alpha energy released by the total decay of short-lived radon daughter products in equilibrium with 100 picocuries of radon 222 per liter of air. A working level month is defined as the exposure received by a worker breathing air at one working level concentration for 4⅓ weeks of 40 hours each.

(2) Occupational exposure to radon daughters in mines shall be controlled so that no individual will receive an exposure of more than 2 working level months in any calendar quarter and no more than 4 working level months in any calendar year. Actual exposures shall be kept as far below these values as practicable.

(3)(i) For uranium mines, records of environmental concentrations in the occupied parts of the mine, and of the time spent in each area by each person involved in an underground work shall be established and maintained. These records shall be in sufficient detail to permit calculations of the exposures, in units of working level months, of the individuals and shall be available for inspection by the Secretary of Labor or his authorized agents.

(ii) For other than uranium mines and for surface workers in all mines, subdivision (i) of this subparagraph will be applicable: *Provided, however,* That if no environmental sample shows a concentration greater than 0.33 working level in any occupied part of the mine, the maintenance of individual occupancy records and the calculation of individual exposures will not be required.

(4)(i) At the request of an employee (or former employee) a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to subparagraph (3) of this paragraph, shall be furnished to him. The report shall be in writing and contain the following statement:

> This report is furnished to you under the provisions of the U.S. Department of Labor, Ionizing Radiation Safety and Health Standards (29 CFR 1910.96(r)). You should preserve this report for future reference.

(ii) The former employee's request should include appropriate identifying data, such as social security number and dates and locations of employment.

§ 1910.97 Nonionizing radiation.

(a) *Electromagnetic radiation*—(1) *Definitions applicable to this paragraph.* (i) The term "electromagnetic radiation" is restricted to that portion of the spectrum commonly defined as the radio frequency region, which for the purpose of this specification shall include the microwave frequency region.

(ii) *Partial body irradiation.* Pertains to the case in which part of the body is exposed to the incident electromagnetic energy.

(iii) *Radiation protection guide.* Radiation level which should not be exceeded without careful consideration of the reasons for doing so.

(iv) The word "symbol" as used in this specification refers to the overall design, shape, and coloring of the rf radiation sign shown in figure G–11.

(v) *Whole body irradiation.* Pertains to the case in which the entire body is exposed to the incident electromagnetic energy or in which the cross section of the body is smaller than the cross section of the incident radiation beam.

(2) *Radiation protection guide.* (i) For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm.^{2} (milliwatt per square centimeter) as averaged over any possible 0.1-hour period. This means the following:

Power density: 10 mW./cm.^{2} for periods of 0.1-hour or more.

Energy density: 1 mW.-hr./cm.^{2} (milliwatt hour per square centimeter) during any 0.1-hour period.

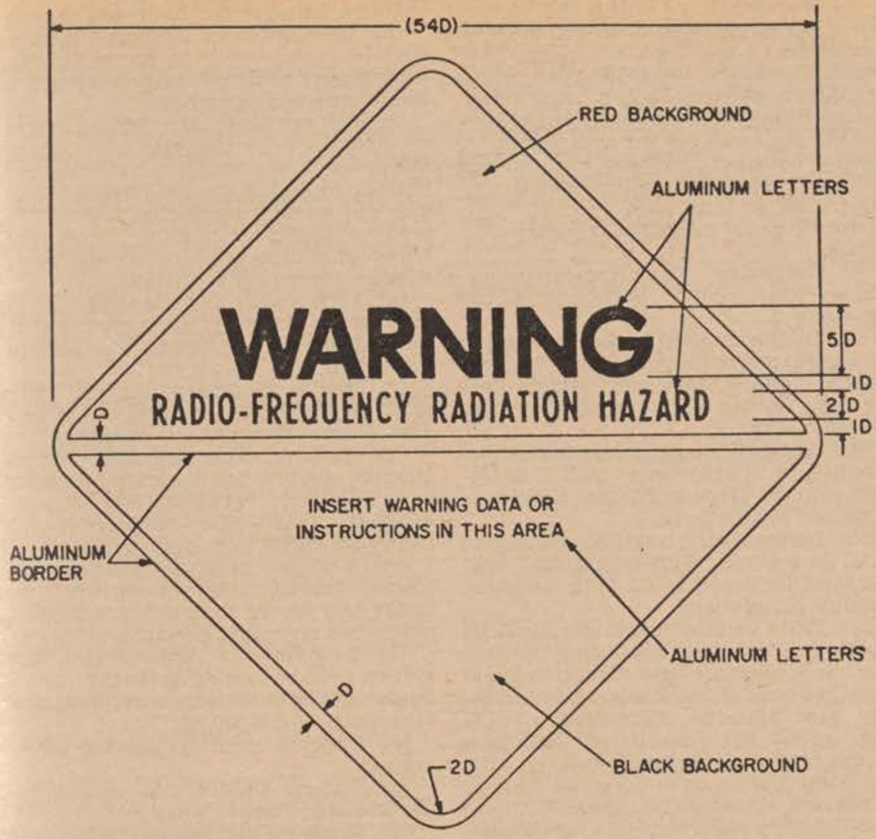
This guide applies whether the radiation is continuous or intermittent.

(ii) These formulated recommendations pertain to both whole body irradiation and partial body irradiation. Partial body irradiation must be included since it has been shown that some parts of the human body (e.g., eyes, testicles) may be harmed if exposed to incident radiation levels significantly in excess of the recommended levels.

(3) *Warning symbol.* (i) The warning symbol for radio frequency radiation hazards shall consist of a red isosceles triangle above an inverted black isosceles triangle, separated and outlined by an aluminum color border. The words "Warning—Radio-Frequency Radiation Hazard" shall appear in the upper triangle. See figure G–11.

(ii) American National Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1–1953, shall be used for color specification. All lettering and the border shall be of aluminum color.

(iii) The inclusion and choice of warning information or precautionary instructions is at the discretion of the user. If such information is included it shall appear in the lower triangle of the warning symbol.



1. Place handling and mounting instructions on reverse side.
2. D = Scaling unit.
3. Lettering: Ratio of letter height to thickness of letter lines.

Upper triangle : 5 to 1 Large
6 to 1 Medium
Lower triangle 4 to 1 Small
6 to 1 Medium

4. Symbol is square, triangles are right-angle isosceles.

Fig. G-11
Radio-Frequency Radiation Hazard Warning Symbol

(4) *Scope.* This section applies to all radiations originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radio navigation, and industrial and scientific purposes. This section does not apply to the deliberate exposure of patients by, or under the direction of, practitioners of the healing arts.

§ 1910.98 Effective dates.

(a) The provisions of this Subpart G shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.94 (a)(2)(iii), (a)(3), (a)(4), (b), (c)(2), (c)(3), (c)(4), (c)(5), (c)(6)(i), (c)(6)(ii), (d)(1)(ii), (d)(3), (d)(4), (d)(5), and (d)(7).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart G which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.99 Sources of standards.

Section	Source
1910.93	41 CFR 50-204.50, except for Table G-2, the source of which is American National Standards Institute, Z37 series.
1910.94(a)	ANSI N2.3-1967, Immediate and Safe Practices, of Abrasive Blasting Operations.
1910.94(b)	ANSI Z43.1-966, Ventilation Control of Grinding, Polishing, and Buffing Operations.
1910.94(c)	ANSI Z9.3-1970, Safety Code for the Design, Construction and Ventilation of Spray Finishing Operations.
1910.94(d)	ANSI Z9.1-1969, Safety Code for Ventilation and Operation of Open-Surface Tanks.
1910.95	41 CFR 50-204.10.
1910.96 (a) through (e) and (g) through (r).	41 CFR 50-204.20.
1910.96(f)	ANSI N2.3-1967, Immediate Evacuation Signal for Use in Industrial Installations Where Radiation Exposure May Occur.
1910.97	ANSI C95.1-1966, Safety Level of Electromagnetic Radiation with Respect to Personnel and American National Standards Institute C95.2-1966, Radio Frequency Radiation Hazard and Warning Signal.

§ 1910.100 Standards organizations.

Specific standards of the following organizations have been referenced in this subpart. Copies of the standards may be obtained from the issuing organization.

American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, OH 45202.
American National Standards Institute, 1430 Broadway, New York, NY 10018.
National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.

Subpart H—Hazardous Materials

§ 1910.101 Compressed gases (general requirements).

(a) *Inspection of compressed gas cylinders.* Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual inspection. Visual and other inspections shall be conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103). Where those regulations are not applicable, visual and other inspections shall be conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962.

(b) *Compressed gases.* The in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks shall be in accordance with Compressed Gas Association Pamphlet P-1-1965.

(c) *Safety relief devices for compressed gas containers.* Compressed gas cylinders, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S–1.1–1963 and 1965 addenda and S–1.2–1963.

§ 1910.102 Acetylene.

(a) *Cylinders.* The in-plant transfer, handling, storage, and utilization of acetylene in cylinders shall be in accordance with Compressed Gas Association Pamphlet G–1–1966.

(b) *Piped systems.* The piped systems for the inplant transfer and distribution of acetylene shall be designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G–1.3–1959.

(c) *Generators and filling cylinders.* Plants for the generation of acetylene and the charging (filling) of acetylene cylinders shall be designed, constructed, and tested in accordance with the standards prescribed in Compressed Gas Association Pamphlet G–1.4–1966.

§ 1910.103 Hydrogen.

(a) *General*—(1) *Definitions.* As used in this section (i) Gaseous hydrogen system is one in which the hydrogen is delivered, stored and discharged in the gaseous form to consumer's piping. The system includes stationary or movable containers, pressure regulators, safety relief devices, manifolds, interconnecting piping and controls. The system terminates at the point where hydrogen at service pressure first enters the consumer's distribution piping.

(ii) Approved—Means unless otherwise indicated listed or approved by the following nationally recognized testing laboratories: Underwriters Laboratories, Inc., and Factory Mutual Engineering Corp.

(iii) Listed—See "approved".

(iv) ASME—American Society of Mechanical Engineers.

(v) DOT Specifications—Regulations of the Department of Transportation published in 49 CFR Chapter I.

(vi) DOT regulations—See § 1910.103 (a)(1)(v).

(2) *Scope*—(i) *Gaseous hydrogen systems.* (*a*) Paragraph (b) of this section applies to the installation of gaseous hydrogen systems on consumer premises where the hydrogen supply to the consumer premises originates outside the consumer premises and is delivered by mobile equipment.

(*b*) Paragraph (b) of this section does not apply to gaseous hydrogen systems having a total hydrogen content of less than 400 cubic feet, nor to hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or his agent for the purpose of storing hydrogen and refilling portable containers, trailers, mobile supply trucks, or tank cars.

(ii) *Liquefied hydrogen systems.* (*a*) Paragraph (c) of this section applies to the installation of liquefied hydrogen systems on consumer premises.

(*b*) Paragraph (c) of this section does not apply to liquefied hydrogen portable containers of less than 150 liters (39.63 gallons) capacity; nor to liquefied hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or his agent for the sole purpose of storing liquefied hydrogen and refilling portable containers, trailers, mobile supply trucks, or tank cars.

(b) *Gaseous hydrogen systems*—(1) *Design.*

(i) *Containers.* (*a*) Hydrogen containers shall comply with one of the following:

(*1*) Designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968.

(*2*) Designed, constructed, tested and maintained in accordance with U.S. Department of Transportation Specifications and Regulations.

(*b*) Permanently installed containers shall be provided with substantial noncombustible supports on firm noncombustible foundations.

(*c*) Each portable container shall be legibly marked with the name "Hydrogen" in accordance with "Marking Portable Compressed Gas Containers to Identify the Material Contained" ANSI Z48.1—1954. Each manifolded hydrogen supply unit shall be legibly marked with the name Hydrogen or a legend such as "This unit contains hydrogen."

(ii) *Safety relief devices.* (*a*) Hydrogen containers shall be equipped with safety relief devices as required by the ASME Boiler and Pressure Vessel Code, Section VIII Unfired Pressure Vessels, 1968 or the DOT Specifications and Regulations under which the container is fabricated.

(*b*) Safety relief devices shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container, adjacent structure or personnel. This requirement does not apply to DOT Specification containers having an internal volume of 2 cubic feet or less.

(*c*) Safety relief devices or vent piping shall be designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

(iii) *Piping, tubing, and fittings.*—(*a*) Piping, tubing, and fittings shall be suitable for hydrogen service and for the pressures and temperatures involved. Cast iron pipe and fittings shall not be used.

(*b*) Piping and tubing shall conform to Section 2—"Industrial Gas and Air Piping"—Code for Pressure Piping, ANSI B31.1-1967 with addenda B31.1-1969.

(*c*) Joints in piping and tubing may be made by welding or brazing or by use of flanged, threaded, socket, or compression fittings. Gaskets and thread sealants shall be suitable for hydrogen service.

(iv) *Equipment assembly.* (*a*) Valves, gauges, regulators, and other accessories shall be suitable for hydrogen service.

(*b*) Installation of hydrogen systems shall be supervised by personnel familiar with proper practices with reference to their construction and use.

(*c*) Storage containers, piping, valves, regulating equipment, and other accessories shall be readily accessible, and shall be protected against physical damage and against tampering.

(*d*) Cabinets or housings containing hydrogen control or operating equipment shall be adequately ventilated.

(*e*) Each mobile hydrogen supply unit used as part of a hydrogen system shall be adequately secured to prevent movement.

(*f*) Mobile hydrogen supply units shall be electrically bonded to the system before discharging hydrogen.

(v) *Marking.* The hydrogen storage location shall be permanently placarded as follows: "HYDROGEN—FLAMMABLE GAS—NO SMOKING—NO OPEN FLAMES," or equivalent.

(vi) *Testing.* After installations, all piping, tubing, and fittings shall be tested and proved hydrogen gas tight at maximum operating pressure.

(2) *Location*—(i) *General.* (*a*) The system shall be located so that it is readily accessible to delivery equipment and to authorized personnel.

(*b*) Systems shall be located above ground.

(*c*) Systems shall not be located beneath electric power lines.

(*d*) Systems shall not be located close to flammable liquid piping or piping of other flammable gases.

(*e*) Systems near aboveground flammable liquid storage shall be located on ground higher than the flammable liquid storage except when dikes, diversion curbs, grading, or separating solid walls are used to prevent accumulation of flammable liquids under the system.

(ii) *Specific requirements.* (*a*) The location of a system, as determined by the maximum total contained volume of hydrogen, shall be in the order of preference as indicated by Roman numerals in Table H-1.

TABLE H-1

Nature of location	Size of hydrogen system		
	Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
Outdoors	I.	I.	I.
In a separate building	II.	II.	II.
In a special room	III.	III.	Not permitted.
Inside buildings not in a special room and exposed to other occupancies.	IV.	Not permitted.	Not permitted.

(*b*) The minimum distance in feet from a hydrogen system of indicated capacity located outdoors, in separate buildings or in special rooms to any specified outdoor exposure shall be in accordance with Table H-2.

(*c*) The distances in Table H-2 Items 1, 14, and 3 to 10 inclusive do not apply where protective structures such as adequate fire walls are located between the system and the exposure.

TABLE H-2

Type of outdoor exposure		Size of hydrogen system		
		Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
1. Building or structure	Wood frame construction*	10	25	50
	Heavy timber, noncombustible or ordinary construction*	0	10	**25
	Fire-resistive construction*	0	0	0
2. Wall openings	Not above any part of a system	10	10	10
	Above any part of a system	25	25	25
3. Flammable liquids above ground.	0 to 1,000 gallons	10	25	25
	In excess of 1,000 gallons	25	50	50
4. Flammable liquids below ground—0 to 1,000 gallons.	Tank	10	10	10
	Vent or fill opening of tank	25	25	25
5. Flammable liquids below ground—in excess of 1,000 gallons.	Tank	20	20	20
	Vent or fill opening of tank	25	25	25
6. Flammable gas storage, either high pressure or low pressure.	0 to 15,000 CF capacity	10	25	25
	In excess of 15,000 CF capacity	25	50	50
7. Oxygen storage	12,000 CF or less	Refer to NFPA No. 51, gas systems for welding and cutting (1969).		
	More than 12,000 CF	Refer to NFPA No. 566, bulk oxygen systems at consumer sites (1969).		
8. Fast burning solids such as ordinary lumber, excelsior or paper		50	50	50
9. Slow burning solids such as heavy timber or coal		25	25	25
10. Open flames and other sources of ignition		25	25	25
11. Air compressor intakes or inlets to ventilating or air-conditioning equipment		50	50	50
12. Concentration of people***		25	50	50
13. Public sidewalks		15	15	15
14. Line of adjoining property which may be built upon		5	5	5

*Refer to NFPA No. 220 Standard Types of Building Construction for definitions of various types of construction. (1969 Ed.)

**But not less than one-half the height of adjacent side wall of the structure.

***In congested areas such as offices, lunchrooms, locker rooms, time-clock areas, and places of public assembly

(*d*) Hydrogen systems of less than 3,000 CF when located inside buildings and exposed to other occupancies shall be situated in the building so that the system will be as follows:

(*1*) In an adequately ventilated area as in subparagraph (3)(ii)(*b*) of this paragraph.

(*2*) Twenty feet from stored flammable materials or oxidizing gases.

(*3*) Twenty-five feet from open flames, ordinary electrical equipment or other sources of ignition.

(*4*) Twenty-five feet from concentrations of people.

(*5*) Fifty feet from intakes of ventilation or air-conditioning equipment and air compressors.

(*6*) Fifty feet from other flammable gas storage.

(*7*) Protected against damage or injury due to falling objects or working activity in the area.

(*8*) More than one system of 3,000 CF or less may be installed in the same room, provided the systems are separated by at least 50 feet. Each such system shall meet all of the requirements of this paragraph.

(3) *Design consideration at specific locations*—(i) *Outdoor locations.* (*a*) Where protective walls or roofs are provided, they shall be constructed of noncombustible materials.

(*b*) Where the enclosing sides adjoin each other, the area shall be properly ventilated.

(*c*) Electrical equipment within 15 feet shall be in accordance with subpart S of this part.

(ii) *Separate buildings.* (*a*) Separate buildings shall be built of at least noncombustible construction. Windows and doors shall be located so as to be readily accessible in case of emergency. Windows shall be of glass or plastic in metal frames.

(*b*) Adequate ventilation to the outdoors shall be provided. Inlet openings shall be located near the floor in exterior walls only. Outlet openings shall be located at the high point of the room in exterior walls or roof. Inlet and outlet openings shall each have minimum total area of one (1) square foot per 1,000 cubic feet of room volume. Discharge from outlet openings shall be directed or conducted to a safe location.

(*c*) Explosion venting shall be provided in exterior walls or roof only. The venting area shall be equal to not less than 1 square foot per 30 cubic feet of room volume and may consist of any one or any combination of the following: walls of light, noncombustible material, preferably single thickness, single strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot.

(*d*) There shall be no sources of ignition from open flames, electrical equipment, or heating equipment.

(*e*) Electrical equipment shall be in accordance with subpart S of this part for Class I, Division 2 locations.

(*f*) Heating, if provided, shall be by steam, hot water, or other indirect means.

(iii) *Special rooms.* (*a*) Floor, walls, and ceiling shall have a fire-resistance rating of at least 2 hours. Walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall shall be an exterior wall. Openings to other parts of the building shall not be permitted. Windows and doors shall be in exterior walls and shall be located so as to be readily accessible in case of emergency. Windows shall be of glass or plastic in metal frames.

(*b*) Ventilation shall be as provided in subdivision (ii)(*b*) of this subparagraph.

(*c*) Explosion venting shall be as provided in subdivision (ii)(*c*) of this subparagraph.

(*d*) There shall be no sources of ignition from open flames, electrical equipment, or heating equipment.

(*e*) Electrical equipment shall be in accordance with Article 501 of the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of 1968), for Class I Division 2 locations.

(*f*) Heating, if provided, shall be by steam, hot water, or indirect means.

(4) *Operating instructions.* For installations which require any operation of equipment by the user, legible instructions shall be maintaind at operating locations.

(5) *Maintenance*—(i) *Inspection.* Each hydrogen system installed on consumer premises shall be periodically inspected and maintained by a qualified representative of the hydrogen supplier.

(ii) *Clear zone.* The area within 15 feet of any hydrogen container shall be kept free of dry vegetation and combustible material.

(c) *Liquefied hydrogen systems*—(1) *Design*—(i) *Containers.* (*a*) Hydrogen containers shall comply with the following: Storage containers shall be designed, constructed, and tested in accordance with appropriate requirements of the ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels (1968) or applicable provisions of API Standard 620, Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Second Edition (June 1963) and Appendix R (April 1965).

(*b*) Portable containers shall be designed, constructed and tested in accordance with DOT Specifications and Regulations.

(ii) *Supports.* Permanently installed containers shall be provided with substantial noncombustible supports securely anchored on firm noncombustible foundations. Steel supports in excess of 18 inches in height shall be protected with a protective coating having a 2-hour fire-resistance rating.

(iii) *Marking.* Each container shall be legibly marked to indicate "LIQUEFIED HYDROGEN—FLAMMABLE GAS."

(iv) *Safety relief devices.* (*a*) (*1*) Stationary liquefied hydrogen containers shall be equipped with safety relief devices sized in accordance with CGA Pamphlet S-1, Part 3, Safety Relief Device Standards for Compressed Gas Storage Containers.

(*2*) Portable liquefied hydrogen containers complying with the U.S. Department of Transportation Regulations shall be equipped with safety relief devices as required in the U.S. Department of Transportation Specifications and Regulations. Safety relief devices shall be sized in accordance with the requirements of CGA Pamphlet S-1, Safety Relief Device Standards, Part 1, Compressed Gas Cylinders and Part 2, Cargo and Portable Tank Containers.

(b) Safety relief devices shall be arranged to discharge unobstructed to the outdoors and in such a manner as to prevent impingement of escaping liquid or gas upon the container, adjacent structures or personnel. See subparagraph (2)(i)(f) of this paragraph for venting of safety relief devices in special locations.

(c) Safety relief devices or vent piping shall be designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

(d) Safety relief devices shall be provided in piping wherever liquefied hydrogen could be trapped between closures.

(v) *Piping, tubing, and fittings.* (a) Piping, tubing, and fittings and gasket and thread sealants shall be suitable for hydrogen service at the pressures and temperatures involved. Consideration shall be given to the thermal expansion and contraction of piping systems when exposed to temperature fluctuations of ambient to liquefied hydrogen temperatures.

(b) Gaseous hydrogen piping and tubing (above −20° F.) shall conform to the applicable sections of Pressure Piping Section 2—Industrial Gas and Air Piping, ANSI B31.1–1967 with addenda B31.1–1969. Design of liquefied hydrogen or cold (−20° F. or below) gas piping shall use Petroleum Refinery Piping ANSI B31.3–1966 or Refrigeration Piping ANSI B31.5–1966 with addenda B31.5a–1968 as a guide.

(c) Joints in piping and tubing shall preferably be made by welding or brazing; flanged, threaded, socket, or suitable compression fittings may be used.

(d) Means shall be provided to minimize exposure of personnel to piping operating at low temperatures and to prevent air condensate from contacting piping, structural members, and surfaces not suitable for cryogenic temperatures. Only those insulating materials which are rated nonburning in accordance with ASTM Procedures D1692–68 may be used. Other protective means may be used to protect personnel. The insulation shall be designed to have a vapor-tight seal in the outer covering to prevent the condensation of air and subsequent oxygen enrichment within the insulation. The insulation material and outside shield shall also be of adequate design to prevent attrition of the insulation due to normal operating conditions.

(e) Uninsulated piping and equipment which operate at liquefied-hydrogen temperature shall not be installed above asphalt surfaces or other combustible materials in order to prevent contact of liquid air with such materials. Drip pans may be installed under uninsulated piping and equipment to retain and vaporize condensed liquid air.

(vi) *Equipment assembly.* (a) Valves, gauges, regulators, and other accessories shall be suitable for liquefied hydrogen service and for the pressures and temperatures involved.

(b) Installation of liquefied hydrogen systems shall be supervised by personnel familiar with proper practices and with reference to their construction and use.

(c) Storage containers, piping, valves, regulating equipment, and other accessories shall be readily accessible and shall be protected against physical damage and against tampering. A shutoff valve shall be located in liquid product withdrawal lines as close to the container as practical. On containers of over 2,000 gallons capacity, this shutoff valve shall be of the remote control type with no connections, flanges, or other appurtenances (other than a welded manual shutoff valve) allowed in the piping between the shutoff valve and its connection to the inner container.

(d) Cabinets or housings containing hydrogen control equipment shall be ventilated to prevent any accumulation of hydrogen gas.

(vii) *Testing.* (a) After installation, all field-erected piping shall be tested and proved hydrogen gas-tight at operating pressure and temperature.

(b) Containers if out of service in excess of 1 year shall be inspected and tested as outlined in (a) of this subdivision. The safety relief devices shall be checked to determine if they are operable and properly set.

(viii) *Liquefied hydrogen vaporizers.* (a) The vaporizer shall be anchored and its connecting piping shall be sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes.

(b) The vaporizer and its piping shall be adequately protected on the hydrogen and heating media sections with safety relief devices.

(c) Heat used in a liquefied hydrogen vaporizer shall be indirectly supplied utilizing media such as air, steam, water, or water solutions.

(d) A low temperature shutoff switch shall be provided in the vaporizer discharge piping to prevent flow of liquefied hydrogen in the event of the loss of the heat source.

(ix) *Electrical systems.* (a) Electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, shall be in accordance with subpart S of this part, for Class I, Group B, Division 1 locations.

(b) Except as provided in (a) of this subdivision, electrical wiring, and equipment located within 25 feet of a point where connections are regularly made and disconnected or within 25 feet of a liquid hydrogen storage container, shall be in accordance with subpart S of this part, for Class I, Group B, Division 2 locations. When equipment approved for class I, group B atmospheres is not commercially available, the equipment may be—

(1) Purged or ventilated in accordance with NFPA No. 496–1967, Standard for Purged Enclosures for Electrical Equipment in Hazardous Locations,

(2) Intrinsically safe, or

(3) Approved for Class I, Group C atmospheres. This requirement does not apply to electrical equipment which is installed on mobile supply trucks or tank cars from which the storage container is filled.

(x) *Bonding and grounding.* The liquefied hydrogen container and associated piping shall be electrically bonded and grounded.

(2) *Location of liquefied hydrogen storage*—(i) *General requirements.* (a) The storage containers shall be located so that they are readily accessible to mobile supply equipment at ground level and to authorized personnel.

(b) The containers shall not be exposed by electric power lines, flammable liquid lines, flammable gas lines, or lines carrying oxidizing materials.

(c) When locating liquified hydrogen storage containers near above-ground flammable liquid storage or liquid oxygen storage, it is advisable to locate the liquefied hydrogen container on ground higher than flammable liquid storage or liquid oxygen storage.

(d) Where it is necessary to locate the liquefied hydrogen container on ground that is level with or lower than adjacent flammable liquid storage or liquid oxygen storage, suitable protective means shall be taken (such as by diking, diversion curbs, grading), with respect to the adjacent flammable liquid storage or liquid oxygen storage, to prevent accumulation of liquids within 50 feet of the liquefied hydrogen container.

(e) Storage sites shall be fenced and posted to prevent entrance by unauthorized personnel. Sites shall also be placarded as follows: "Liquefied Hydrogen—Flammable Gas—No Smoking—No Open Flames."

(f) If liquified hydrogen is located in (as specified in Table H-3) a separate building, in a special room, or inside buildings when not in a special room and exposed to other occupancies, containers shall have the safety relief devices vented unobstructed to the outdoors at a minimum elevation of 25 feet above grade to a safe location as required in subparagraph (1)(iv)(b) of this paragraph.

(ii) *Specific requirements.* (a) The location of liquefied hydrogen storage, as determined by the maximum total quantity of liquified hydrogen, shall be in the order of preference as indicated by Roman numerals in the following Table H-3.

TABLE H-3—MAXIMUM TOTAL QUANTITY OF LIQUEFIED HYDROGEN STORAGE PERMITTED

Nature of location	Size of hydrogen storage (capacity in gallons)			
	39.63 (150 liters) to 50	51 to 300	301 to 600	In excess of 600
Outdoors	I	I	I	I.
In a separate building	II	II	II	Not permitted.
In a special room	III	III	Not permitted	Not permitted.
Inside buildings not in a special room and exposed to other occupancies.	IV	Not permitted	Not permitted	Not permitted.

NOTE: This table does not apply to the storage in dewars of the type generally used in laboratories for experimental purposes.

(*b*) The minimum distance in feet from liquefied hydrogen systems of indicated storage capacity located outdoors, in a separate building, or in a special room to any specified exposure shall be in accordance with Table H-4.

TABLE H-4—MINIMUM DISTANCE (FEET) FROM LIQUEFIED HYDROGEN SYSTEMS TO EXPOSURE

Type of exposure	Liquefied hydrogen storage (capacity in gallons)		
	39.63 (150 liters) to 3,500	3,501 to 15,000	15,001 to 30,000
1. Fire-resistive building and fire walls*	5	5	5
2. Noncombustible building*	25	50	75
3. Other buildings*	50	75	100
4. Wall openings, air-compressor intakes, inlets for air-conditioning or ventilating equipment	75	75	75
5. Flammable liquids (above ground and vent or fill openings if below ground) (see 513 and 514)	50	75	100
6. Between stationary liquefied hydrogen containers	5	5	5
7. Flammable gas storage	50	75	100
8. Liquid oxygen storage and other oxidizers (see 513 and 514)	100	100	100
9. Combustible solids	50	75	100
10. Open flames, smoking, and welding	50	50	50
11. Concentrations of people†	75	75	75
12. Public ways, railroads, and property lines	25	50	75

*Refer to Standard Types of Building Construction, NFPA No. 220-1969 for definitions of various types of construction.

†In congested areas such as offices, lunchrooms, locker rooms, time-clock areas, and places of public assembly.

NOTE 1: The distance in Nos. 2, 3, 5, 7, 9, and 12 in Table H-4 may be reduced where protective structures, such as firewalls equal to height of top of the container, to safeguard the liquefied hydrogen storage system, are located between the liquefied hydrogen storage installation and the exposure.

NOTE 2: Where protective structures are provided, ventilation and confinement of product should be considered. The 5-foot distance in Nos. 1 and 6 facilitates maintenance and enhances ventilation.

(iii) *Handling of liquefied hydrogen inside buildings other than separate buildings and special rooms.* Portable liquefied hydrogen containers of 50 gallons or less capacity as permitted in Table H-3 and in compliance with subdivision (i) (*f*) of this subparagraph when housed inside buildings not located in a special room and exposed to other occupancies shall comply with the following minimum requirements:

(*a*) Be located 20 feet from flammable liquids and readily combustible materials such as excelsior or paper.

(*b*) Be located 25 feet from ordinary electrical equipment and other sources of ignition including process or analytical equipment.

(*c*) Be located 25 feet from concentrations of people.

(*d*) Be located 50 feet from intakes of ventilation and air-conditioning equipment or intakes of compressors.

(*e*) Be located 50 feet from storage of other flammable-gases or storage of oxidizing gases.

(*f*) Containers shall be protected against damage or injury due to falling objects or work activity in the area.

(*g*) Containers shall be firmly secured and stored in an upright position.

(*h*) Welding or cutting operations, and smoking shall be prohibited while hydrogen is in the room.

(*i*) The area shall be adequately ventilated. Safety relief devices on the containers shall be vented directly outdoors or to a suitable hood. See subparagraph (1) (iv) (*b*) of this paragraph and subdivision (i) (*f*) of this subparagraph.

(3) *Design considerations at specific locations*—(i) *Outdoor locations.* (*a*) Outdoor location shall mean outside of any building or structure, and includes locations under a weather shelter or canopy provided such locations are not enclosed by more than two walls set at right angles and are provided with vent-space between the walls and vented roof or canopy.

(*b*) Roadways and yard surfaces located below liquefied hydrogen piping, from which liquid air may drip, shall be constructed of noncombustible materials.

(*c*) If protective walls are provided, they shall be constructed of noncombustible materials and in accordance with the provisions of subdivision (*a*) of this subdivision as applicable.

(*d*) Electrical wiring and equipment shall comply with subparagraph (1) (ix) (*a*) and (*b*) of this paragraph.

(*e*) Adequate lighting shall be provided for nighttime transfer operation.

(ii) *Separate buildings.* (*a*) Separate buildings shall be of light noncombustible construction on a substantial frame. Walls and roofs shall be lightly fastened and designed to relieve at a maximum internal pressure of 25 pounds per square foot. Windows shall be of shatterproof glass or plastic in metal frames. Doors shall be located in such a manner that they will be readily accessible to personnel in an emergency.

(*b*) Adequate ventilation to the outdoors shall be provided. Inlet openings shall be located near the floor level in exterior walls only. Outlet openings shall be located at the high point of the room in exterior walls or roof. Both the inlet and outlet vent openings shall have a minimum total area of 1 square foot per 1,000 cubic feet of room volume. Discharge from outlet openings shall be directed or conducted to a safe location.

(*c*) There shall be no sources of ignition.

(*d*) Electrical wiring and equipment shall comply with subparagraph (1) (ix) (*a*) and (*b*) of this paragraph except that the provisions of subparagraph (1) (ix) (*b*) of this paragraph shall apply to all electrical wiring and equipment in the separate building.

(*e*) Heating, if provided, shall be by steam, hot water, or other indirect means.

(iii) *Special rooms.* (*a*) Floors, walls, and ceilings shall have a fire resistance rating of at least 2 hours. Walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall shall be an exterior wall. Openings to other parts of the building shall not be permitted. Windows and doors shall be in exterior walls and doors shall be located in such a manner that they will be accessible in an emergency. Windows shall be of shatterproof glass or plastic in metal frames.

(*b*) Ventilation shall be as provided in subdivision (ii) (*b*) of this subparagraph.

(*c*) Explosion venting shall be provided in exterior walls or roof only. The venting area shall be equal to not less than 1 square foot per 30 cubic feet of room volume and may consist of any one or any combination of the following: walls of light noncombustible material; lightly fastened hatch covers; lightly fastened swinging doors opening outward in exterior walls; lightly fastened walls or roofs designed to relieve at a maximum pressure of 25 pounds per square foot.

(*d*) There shall be no sources of ignition.

(*e*) Electrical wiring and equipment shall comply with subparagraph (1) (ix) (*a*) and (*b*) of this paragraph except that the provision of subparagraph (1) (ix) (*b*) of this paragraph shall apply to all electrical wiring and equipment in the special room.

(*f*) Heating, if provided, shall be steam, hot water, or by other indirect means.

(4) *Operating instructions*—(i) *Written instructions.* For installation which require any operation of equipment by the user, legible instructions shall be maintained at operating locations.

(ii) *Attendant.* A qualified person shall be in attendance at all times while the mobile hydrogen supply unit is being unloaded.

(iii) *Security.* Each mobile liquefied hydrogen supply unit used as part of a hydrogen system shall be adequately secured to prevent movement.

(iv) *Grounding.* The mobile liquefied hydrogen supply unit shall be grounded for static electricity.

(5) *Maintenance*—(i) Inspection. Each liquefied hydrogen system installed on consumer premises shall be periodically inspected and maintained by a qualified representative of the equipment owner.

(ii) *Clear Zone.* Weeds or similar combustibles shall not be permitted within 25 feet of any liquefied hydrogen equipment.

§ 1910.104 Oxygen.

(a) *Scope.* This section applies to the installation of bulk oxygen systems on industrial and institutional consumer premises. This section does not apply to oxygen manufacturing plants or other establishments operated by the oxygen supplier or his agent for the purpose of storing oxygen and refilling portable containers, trailers, mobile supply trucks, or tank cars, nor to systems having capacities less than those stated in paragraph (b)(1) of this section.

(b) *Bulk oxygen systems.*—(1) *Definition.* As used in this section: A bulk oxygen system is an assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, which has storage capacity of more than 13,000 cubic feet of oxygen, Normal Temperature and Pressure (NTP), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (NTP) including unconnected reserves on hand at the site. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. The oxygen containers may be stationary or movable, and the oxygen may be stored as gas or liquid.

(2) *Location*—(i) *General.* Bulk oxygen storage systems shall be located above ground out of doors, or shall be installed in a building of noncombustible construction, adequately vented, and used for that purpose exclusively. The location selected shall be such that containers and associated equipment shall not be exposed by electric power lines, flammable or combustible liquid lines, or flammable gas lines.

(ii) *Accessibility.* The system shall be located so that it is readily accessible to mobile supply equipment at ground level and to authorized personnel.

(iii) *Leakage.* Where oxygen is stored as a liquid, noncombustible surfacing shall be provided in an area in which any leakage of liquid oxygen might fall during operation of the system and filling of a storage container. For purposes of this paragraph, asphaltic or bituminous paving is considered to be combustible.

(iv) *Elevation.* When locating bulk oxygen systems near above-ground flammable or combustible liquid storage which may be either indoors or outdoors, it is advisable to locate the system on ground higher than the flammable or combustible liquid storage.

(v) *Dikes.* Where it is necessary to locate a bulk oxygen system on ground lower than adjacent flammable or combustible liquid storage suitable means shall be taken (such as by diking, diversion curbs, or grading) with respect to the adjacent flammable or combustible liquid storage to prevent accumulation of liquids under the bulk oxygen system.

(3) *Distance between systems and exposures*—(i) *General.* The minimum distance from any bulk oxygen storage container to exposures, measured in the most direct line except as indicated in subdivisions (vi) and (viii) of this subparagraph, shall be as indicated in subdivisions (ii) to (xviii) of this subparagraph inclusive.

(ii) *Combustible structures.* Fifty feet from any combustible structures.

(iii) *Fire resistive structures.* Twenty-five feet from any structures with fire-resistive exterior walls or sprinklered buildings of other construction, but not less than one-half the height of adjacent side wall of the structure.

(iv) *Openings.* At least 10 feet from any opening in adjacent walls of fire resistive structures. Spacing from such structures shall be adequate to permit maintenance, but shall not be less than 1 foot.

(v) *Flammable liquid storage aboveground.*

Distance (feet)	*Capacity (gallons)*
50	0–1000
90	1001 or more

(vi) *Flammable liquid storage belowground.*

Distance measured horizontally from oxygen storage container to flammable liquid tank (feet)	Distance from oxygen storage container to filling and vent connections or openings to flammable liquid tank (feet)	Capacity gallons
15	50	0–1000.
30	50	1001 or more

(vii) *Combustible liquid storage aboveground.*

Distance (feet)	*Capacity (gallons)*
25	0–1000
50	1001 or more

(viii) *Combustible liquid storage belowground.*

Distance measured horizontally from oxygen storage container to combustible liquid tank (feet)	*Distance from oxygen storage container to filling and vent connections or openings to combustible liquid tank (feet)*
15	40

(ix) *Flammable gas storage.* (Such as compressed flammable gases, liquefied flammable gases and flammable gases in low pressure gas holders):

Distance (feet)	*Capacity (cu. ft. NTP)*
50	Less than 5000
90	5000 or more

(x) *Highly combustible materials.* Fifty feet from solid materials which burn rapidly, such as excelsior or paper.

(xi) *Slow-burning materials.* Twenty-five feet from solid materials which burn slowly, such as coal and heavy timber.

(xii) *Ventilation.* Seventy-five feet in one direction and 35 feet in approximately 90° direction from confining walls (not including firewalls less than 20 feet high) to provide adequate ventilation in courtyards and similar confining areas.

(xiii) *Congested areas.* Twenty-five feet from congested areas such as offices, lunchrooms, locker rooms, time clock areas, and similar locations where people may congregate.

(xiv) *Public areas.* Fifty feet from places of public assembly.

(xv) *Patients.* Fifty feet from areas occupied by nonambulatory patients.

(xvi) *Sidewalks.* Ten feet from any public sidewalk.

(xvii) *Adjacent property.* Five feet from any line of adjoining property.

(xviii) *Exceptions.* The distances in subdivisions (ii), (iii), (v) to (xi) inclusive, (xvi), and (xvii) of this subparagraph do not apply where protective structures such as firewalls of adequate height to safeguard the oxygen storage systems are located between the bulk oxygen storage installation and the exposure. In such cases, the bulk oxygen storage installation may be a minimum distance of 1 foot from the firewall.

(4) *Storage containers*—(i) *Foundations and supports.* Permanently installed containers shall be provided with substantial noncombustible supports on firm noncombustible foundations.

(ii) *Construction—liquid.* Liquid oxygen storage containers shall be fabricated from materials meeting the impact test requirements of paragraph UG–84 of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968. Containers operating at pressures above 15 pounds per square inch gage (p.s.i.g.) shall be designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VII—Unfired Pressure Vessels—1968. Insulation surrounding the liquid oxygen container shall be noncombustible.

(iii) *Construction—gaseous.* High-pressure gaseous oxygen containers shall comply with one of the following:

(*a*) Designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968.

(*b*) Designed, constructed, tested, and maintained in accordance with DOT Specifications and Regulations.

(5) *Piping, tubing, and fittings*—(i) *Selection.* Piping, tubing, and fittings shall be suitable for oxygen service and for the pressures and temperatures involved.

(ii) *Specification.* Piping and tubing shall conform to Section 2—Gas and Air Piping Systems of Code for Pressure Piping, ANSI, B31.1–1967 with addenda B31.10a–1969.

(iii) *Fabrication.* Piping or tubing for operating temperatures below −20° F. shall be fabricated from materials meeting the impact test requirements of paragraph UG–84 of ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessels—1968, when tested at the minimum operating temperature to which the piping may be subjected in service.

(6) *Safety relief devices*—(i) *General*. Bulk oxygen storage containers, regardless of design pressure shall be equipped with safety relief devices as required by the ASME code or the DOT specifications and regulations.

(ii) *DOT containers*. Bulk oxygen storage containers designed and constructed in accordance with DOT specification shall be equipped with safety relief devices as required thereby.

(iii) *ASME containers*. Bulk oxygen storage containers designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII—Unfired Pressure Vessel—1968 shall be equipped with safety relief devices meeting the provisions of the Compressed Gas Association Pamphlet "Safety Relief Device Standards for Compressed Gas Storage Containers," S–1, Part 3.

(iv) *Insulation*. Insulation casings on liquid oxygen containers shall be equipped with suitable safety relief devices.

(v) *Reliability*. All safety relief devices shall be so designed or located that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

(7) *Liquid oxygen vaporizers*—(i) *Mounts and couplings*. The vaporizer shall be anchored and its connecting piping be sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes.

(ii) *Relief devices*. The vaporizer and its piping shall be adequately protected on the oxygen and heating medium sections with safety relief devices.

(iii) *Heating*. Heat used in an oxygen vaporizer shall be indirectly supplied only through media such as steam, air, water, or water solutions which do not react with oxygen.

(iv) *Grounding*. If electric heaters are used to provide the primary source of heat, the vaporizing system shall be electrically grounded.

(8) *Equipment assembly and installation*—(i) *Cleaning*. Equipment making up a bulk oxygen system shall be cleaned in order to remove oil, grease or other readily oxidizable materials before placing the system in service.

(ii) *Joints*. Joints in piping and tubing may be made by welding or by use of flanged, threaded, slip, or compression fittings. Gaskets or thread sealants shall be suitable for oxygen service.

(iii) *Accessories*. Valves, gages, regulators, and other accessories shall be suitable for oxygen service.

(iv) *Installation*. Installation of bulk oxygen systems shall be supervised by personnel familiar with proper practices with reference to their construction and use.

(v) *Testing*. After installation all field erected piping shall be tested and proved gas tight at maximum operating pressure. Any medium used for testing shall be oil free and nonflammable.

(vi) *Security*. Storage containers, piping, valves, regulating equipment, and other accessories shall be protected against physical damage and against tampering.

(vii) *Venting*. Any enclosure containing oxygen control or operating equipment shall be adequately vented.

(viii) *Placarding*. The bulk oxygen storage location shall be permanently placarded to indicate: "OXYGEN—NO SMOKING—NO OPEN FLAMES", or an equivalent warning.

(ix) *Electrical wiring*. Bulk oxygen installations are not hazardous locations as defined and covered in subpart S of this part. Therefore, general purpose or weatherproof types of electrical wiring and equipment are acceptable depending upon whether the installation is indoors or outdoors. Such equipment shall be installed in accordance with the applicable provisions of subpart S of this part.

(9) *Operating instructions*. For installations which require any operation of equipment by the user, legible instructions shall be maintained at operating locations.

(10) *Maintenance* — (i) *Inspection*. Each bulk oxygen system installed on consumer premises shall be periodically inspected and maintained by a qualified representative of the oxygen supplier.

(ii) *Clear zone*. Weeds and long dry grass shall be cut back within 15 feet of any bulk oxygen storage container.

§ 1910.105 Nitrous oxide.

The piped systems for the in-plant transfer and distribution of nitrous oxide shall be designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G–8.1–1964.

§ 1910.106 Flammable and combustible liquids.

(a) *Definitions*. As used in this section:

(1) Aerosol shall mean a material which is dispensed from its container as a mist, spray, or foam by a propellant under pressure.

(2) Atmospheric tank shall mean a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g.

(3) Automotive service station shall mean that portion of property where flammable or combustible liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles and shall include any facilities available for the sale and service of tires, batteries, and accessories, and for minor automotive maintenance work. Major automotive repairs, painting, body and fender work are excluded.

(4) Basement shall mean a story of a building or structure having one-half or more of its height below ground level and to which access for fire fighting purposes is unduly restricted.

(5) Boiling point shall mean the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this section the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D–86–62, may be used as the boiling point of the liquid.

(6) Boilover shall mean the expulsion of crude oil (or certain other liquids) from a burning tank. The light fractions of the crude oil burnoff producing a heat wave in the residue, which on reaching a water strata may result in the expulsion of a portion of the contents of the tank in the form of froth.

(7) Bulk plant shall mean that portion of a property where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipeline, tank car, tank vehicle, or container.

(8) Chemical plant shall mean a large integrated plant or that portion of such a plant other than a refinery or distillery where flammable or combustible liquids are produced by chemical reactions or used in chemical reactions.

(9) Closed container shall mean a container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

(10) Crude petroleum shall mean hydrocarbon mixtures that have a flash point below 150° F. and which have not been processed in a refinery.

(11) Distillery shall mean a plant or that portion of a plant where flammable or combustible liquids produced by fermentation are concentrated, and where the concentrated products may also be mixed, stored, or packaged.

(12) Fire area shall mean an area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

(13) Flammable aerosol shall mean an aerosol which is required to be labeled "Flammable" under the Federal Hazardous Substances Labeling Act (15 U.S.C. 1261). For the purposes of paragraph (d) of this section, such aerosols are considered Class IA liquids.

(14) Flashpoint of the liquid shall mean the temperature at which it gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or within the vessel used as determined by appropriate test procedure and apparatus as specified below.

(i) The flashpoint of liquids having a viscosity less than 45 SUS at 100° F. (37.8° C.) and a flashpoint below 175° F. (79.4° C.) shall be determined in accordance with the Standard Method of Test for Flashpoint by the Tag Closed Tester, ASTM D–56–69.

(ii) The flashpoint of liquids having a viscosity of 45 SUS or more at 100° F. (37.8° C.) or a flashpoint of 175° F.

(79.4° C.) or higher shall be determined in accordance with the Standard Method of Test for Flashpoint by the Pensky Martens Closed Tester, ASTM D-93-69.

(15) Hotel shall mean buildings or groups of buildings under the same management in which there are sleeping accommodations for hire, primarily used by transients who are lodged with or without meals including but not limited to inns, clubs, motels, and apartment hotels.

(16) Institutional occupancy shall mean the occupancy or use of a building or structure or any portion thereof by persons harbored or detained to receive medical, charitable or other care or treatment, or by persons involuntarily detained.

(17) Liquid shall mean, for the purpose of this section, any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM Test for Penetration for Bituminous Materials, D-5-65. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.

(18) Combustible liquids shall mean any liquid having a flashpoint at or above 140° F. (60° C.), and shall be known as Class III liquids. Class IIIA shall include those having flashpoints at or above 140° F. (60° C.) and below 200° F. (93.4° C.). Class IIIB shall include those having flashpoints at or above 200° F. (93.4° C.).

This section does not cover Class IIIB liquids. Where the term combustible liquids or Class III liquids is used in this section, it shall mean only Class IIIA liquids.

NOTE: The upper limit of 200° F. is given because the application of this section does not extend to liquids having flashpoints above 200° F. and should not be construed as indicating that liquids with higher flashpoints are noncombustible.

(19) Flammable liquids shall mean any liquid having a flashpoint below 140° F. and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100° F.

(i) Flammable liquids shall be divided into two classes of liquids as follows:

(ii) Class I liquids shall include those having flashpoints below 100° F. and may be subdivided as follows:

(a) Class IA shall include those having flashpoints below 73° F. and having a boiling point below 100° F.

(b) Class IB shall include those having flashpoints below 73° F. and having a boiling point at or above 100° F.

(c) Class IC shall include those having flashpoints at or above 73° F. and below 100° F.

(iii) Class II liquids shall include those having flashpoints at or above 100° F. and below 140° F.

NOTE: The volatility of liquids is increased when artificially heated to temperatures equal to or higher than their flashpoints. When so heated Class II and III liquids shall be subject to the applicable requirements for Class I or II liquids. This section may also be applied to high flashpoint liquids when so heated even though these same liquids when not heated are outside of its scope.

(20) Unstable (reactive) liquid shall mean a liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

(21) Low-pressure tank shall mean a storage tank which has been designed to operate at pressures above 0.5 p.s.i.g. but not more than 15 p.s.i.g.

(22) Marine service station shall mean that portion of a property where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft, and shall include all facilities used in connection therewith.

(23) Mercantile occupancy shall mean the occupancy or use of a building or structure or any portion thereof for the displaying, selling, or buying of goods, wares, or merchandise.

(24) Office occupancy shall mean the occupancy or use of a building or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional services.

(25) Portable tank shall mean a closed container having a liquid capacity over 60 U.S. gallons and not intended for fixed installation.

(26) Pressure vessel shall mean a storage tank or vessel which has been designed to operate at pressures above 15 p.s.i.g.

(27) Protection for exposure shall mean fire protection for structures on property adjacent to tanks. When acceptable to the authority having jurisdiction, such structures located (i) within the jurisdiction of any public fire department or (ii) within or adjacent to plants having private fire brigades shall be considered as having adequate protection for exposures.

(28) Refinery shall mean a plant in which flammable or combustible liquids are produced on a commercial scale from crude petroleum, natural gasoline, or other hydrocarbon sources.

(29) Safety can shall mean an approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

(30) Vapor pressure shall mean the pressure, measured in pounds per square inch (absolute) exerted by a volatile liquid as determined by the "Standard Method of Test for Vapor Pressure of Petroleum Products (Reid Method)," American Society for Testing and Materials ASTM D323-68.

(31) Ventilation as specified in this section is for the prevention of fire and explosion. It is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

(32) Storage: Flammable or combustible liquids shall be stored in a tank or in a container that complies with paragraph (d)(2) of this section.

(33) Barrel shall mean a volume of 42 U.S. gallons.

(34) Container shall mean any can, barrel, or drum.

(35) Approved unless otherwise indicated, approved, or listed by at least one of the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factory Mutual Engineering Corp.

(36) Listed see "approved" in § 1910.106(a)(35).

(b) *Tank storage*—(1) *Design and construction of tanks*—(i) *Materials.* *(a)* Tanks shall be built of steel except as provided in *(b)* through *(e)* of this subdivision.

(b) Tanks may be built of materials other than steel for installation underground or if required by the properties of the liquid stored. Tanks located above ground or inside buildings shall be of noncombustible construction.

(c) Tanks built of materials other than steel shall be designed to specifications embodying principles recognized as good engineering design for the material used.

(d) Unlined concrete tanks may be used for storing flammable or combustible liquids having a gravity of 40° API or heavier. Concrete tanks with special lining may be used for other services provided the design is in accordance with sound engineering practice.

(e) Tanks may have combustible or noncombustible linings.

(f) Special engineering consideration shall be required if the specific gravity of the liquid to be stored exceeds that of water or if the tanks are designed to contain flammable or combustible liquids at a liquid temperature below 0° F.

(ii) *Fabrication.* *(a)* Tanks may be of any shape or type consistent with sound engineering design.

(b) Metal tanks shall be welded, riveted, and caulked, brazed, or bolted, or constructed by use of a combination of these methods. Filler metal used in brazing shall be nonferrous metal or an alloy having a melting point above 1000° F. and below that of the metal joined.

(iii) *Atmospheric tanks.* *(a)* Atmospheric tanks shall be built in accordance with acceptable good standards of design. Atmospheric tanks may be built in accordance with:

(1) Underwriters' Laboratories, Inc., Subjects No. 142, Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids, 1968; No. 58, Standard for Steel Underground Tanks for Flammable and Combustible Liquids, Fifth Edition, December 1961; or No. 80, Standard for Steel Inside Tanks for Oil-Burner Fuel, September 1963.

(2) American Petroleum Institute Standards No. 12A, Specification for Oil Storage Tanks with Riveted Shells, Seventh Edition, September 1951, or No. 650, Welded Steel Tanks for Oil Storage, Third Edition, 1966.

(3) American Petroleum Institute Standards No. 12B, Specification for Bolted Production Tanks, Eleventh Edition, May 1958, and Supplement 1,

March 1962; No. 12D, Specification for Large Welded Production Tanks, Seventh Edition, August 1957; or No. 12F, Specification for Small Welded Production Tanks, Fifth Edition, March 1961. Tanks built in accordance with these standards shall be used only as production tanks for storage of crude petroleum in oil-producing areas.

(*b*) Tanks designed for underground service not exceeding 2,500 gallons capacity may be used aboveground.

(*c*) Low-pressure tanks and pressure vessels may be used as atmospheric tanks.

(*d*) Atmospheric tanks shall not be used for the storage of a flammable or combustible liquid at a temperature at or above its boiling point.

(iv) *Low pressure tanks.* (*a*) The normal operating pressure of the tank shall not exceed the design pressure of the tank.

(*b*) Low-pressure tanks shall be built in accordance with acceptable standards of design. Low-pressure tanks may be built in accordance with:

(*1*) American Petroleum Institute Standard No. 620, Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Third Edition, 1966.

(*2*) The principles of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessels Code, 1968.

(*c*) Atmospheric tanks built according to Underwriters' Laboratories, Inc., requirements in subdivision (iii)(*a*) of this subparagraph may be used for operating pressures not exceeding 1 p.s.i.g. and shall be limited to 2.5 p.s.i.g. under emergency venting conditions.

(*d*) Pressure vessels may be used as low-pressure tanks.

(v) *Pressure vessels.* (*a*) The normal operating pressure of the vessel shall not exceed the design pressure of the vessel.

(*b*) Pressure vessels shall be built in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code, 1968.

(vi) *Provisions for internal corrosion.* When tanks are not designed in accordance with the American Petroleum Institute, American Society of Mechanical Engineers, or the Underwriters' Laboratories, Inc.'s, standards, or if corrosion is anticipated beyond that provided for in the design formulas used, additional metal thickness or suitable protective coatings or linings shall be provided to compensate for the corrosion loss expected during the design life of the tank.

(2) *Installation of outside aboveground tanks.*—(i) *Location with respect to property lines and public ways.* (*a*) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil-over characteristics and unstable liquids, operating at pressures not in excess of 2.5 p.s.i.g. and equipped with emergency venting which will not permit pressures to exceed 2.5 p.s.i.g. shall be located in accordance with Table H-5.

(*b*) Every aboveground tank for the storage of flammable or combustible liquids, except those liquids with boil-over characteristics and unstable flammable or combustible liquids, operating at pressures exceeding 2.5 p.s.i.g. or equipped with emergency venting which will permit pressures to exceed 2.5 p.s.i.g. shall be located in accordance with Table H-6.

TABLE H-5

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building and shall be not less than 5 feet
Floating roof	Protection for exposures.	½ times diameter of tank but need not exceed 90 ft.	⅙ times diameter of tank but need not exceed 30 ft.
	None	Diameter of tank but need not exceed 175 ft.	⅙ times diameter of tank but need not exceed 30 ft.
Vertical with weak roof to shell seam.	Approved foam or inerting system on the tank.	½ times diameter of tank but need not exceed 90 ft. and shall not be less than 5 ft.	⅙ times diameter of tank but need not exceed 30 ft.
	Protection for exposures.	Diameter of tank but, need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	⅓ times diameter of tank but need not exceed 60 ft.
Horizontal and vertical, with emergency relief venting to limit pressures to 2.5 p.s.i.g.	Approved inerting system on the tank or approved foam system on vertical tanks.	½ times Table H-9 but shall not be less than 5 ft.	½ times Table H-9.
	Protection for exposures.	Table H-9	Table H-9.
	None	2 times Table H-9	Table H-9.

TABLE H-6

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Any type	Protection for exposures.	1½ times Table H-9 but shall not be less than 25 ft.	1½ times Table H-9 but shall not be less than 25 ft.
	None	3 times Table H-9 but shall not be less than 50 ft.	1½ times Table H-9 but shall not be less than 25 ft.

(*c*) Every aboveground tank for the storage of flammable or combustible liquids with boil-over characteristics shall be located in accordance with Table H-7.

TABLE H-7

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Floating roof	Protection for exposures.	Diameter of tank but need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	None	2 times diameter of tank but need not exceed 350 ft.	⅓ times diameter of tank but need not exceed 60 ft.
Fixed roof	Approved foam or inerting system.	Diameter of tank but need not exceed 175 ft.	⅓ times diameter of tank but need not exceed 60 ft.
	Protection for exposures.	2 times diameter of tank but need not exceed 350 ft.	⅔ times diameter of tank but need not exceed 120 ft.
	None	4 times diameter of tank but need not exceed 350 ft.	⅔ times diameter of tank but need not exceed 120 ft.

(*d*) Every aboveground tank for the storage of unstable liquids shall be located in accordance with Table H-8.

TABLE H-8

Type of tank	Protection	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
Horizontal and vertical tanks with emergency relief venting to permit pressure not in excess of 2.5 p.s.i.g.	Tank protected with any one of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	See table H-9, but the distance may be not less than 25 ft.	Not less than 25 ft.
	Protection for exposures	2½ times Table H-9 but not less than 50 ft.	Not less than 50 ft.
	None	5 times table H-9 but not less than 100 ft.	Not less than 100 ft.
Horizontal and vertical tanks with emergency relief venting to permit pressure over 2.5 p.s.i.g.	Tank protected with any one of the following: Approved water spray, approved inerting, approved insulation and refrigeration, approved barricade.	2 times table H-9 but not less than 50 ft.	Not less than 50 ft.
	Protection for exposures	4 times table H-9 but not less than 100 ft.	Not less than 100 ft.
	None	8 times table H-9 but not less than 150 ft.	Not less than 150 ft.

(*e*) Reference minimum distances for use in Tables H-5 to H-8, inclusive.

TABLE H-9

Capacity tank gallons	Minimum distance in feet from property line which may be built upon, including the opposite side of a public way	Minimum distance in feet from nearest side of any public way or from nearest important building
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

(*f*) Where end failure or horizontal pressure tanks and vessels may expose property, the tank shall be placed with the longitudinal axis parallel to the nearest important exposure.

(ii) *Spacing (shell-to-shell) between aboveground tanks.* (*a*) The distance between any two flammable or combustible liquid storage tanks shall not be less than 3 feet.

(*b*) Except as provided in subdivision (*c*) of this subdivision, the distance between any two adjacent tanks shall not be less than one-sixth the sum of their diameters. When the diameter of one tank is less than one-half the diameter of the adjacent tank, the distance between the two tanks shall not be less than one-half the diameter of the smaller tank.

(*c*) Where crude petroleum in conjunction with production facilities are located in noncongested areas and have capacities not exceeding 126,000 gallons (3,000 barrels), the distance between such tanks shall not be less than 3 feet.

(*d*) Where unstable flammable or combustible liquids are stored, the distance between such tanks shall not be less than one-half the sum of their diameters.

(*e*) When tanks are compacted in three or more rows or in an irregular pattern, greater spacing or other means shall be provided so that inside tanks are accessible for firefighting purposes.

(*f*) The minimum separation between a liquefied petroleum gas container and a flammable or combustible liquid storage tank shall be 20 feet, except in the case of flammable or combustible liquid tanks operating at pressures exceeding 2.5 p.s.i.g. or equipped with emergency venting which will permit pressures to exceed 2.5 p.s.i.g. in which case the provisions of subdivisions (*a*) and (*b*) of this subdivision shall apply. Suitable means shall be taken to prevent the accumulation of flammable or combustible liquids under adjacent liquefied petroleum gas containers such as by diversion curbs or grading. When flammable or combustible liquid storage tanks are within a diked area, the liquefied petroleum gas containers shall be outside the diked area and at least 10 feet away from the centerline of the wall of the diked area. The foregoing provisions shall not apply when liquefied petroleum gas containers of 125 gallons or less capacity are installed adjacent to fuel oil supply tanks of 550 gallons or less capacity.

(iii) *Location of outside aboveground tanks with respect to important buildings on same property.* Every outside aboveground tank shall be separated from important buildings on the same property by distances not less than those specified in subdivisions (i) (*a*), (*b*), (*c*), and (*d*) of this subparagraph, whichever is applicable. The appropriate distance column in Tables H-5, H-6, H-7, H-8, or H-9, that shall be used shall be the one reading: "Minimum Distance in Feet from Nearest Side of Any Public Way or From Nearest Important Building."

(iv) *Normal venting for aboveground tanks.* (*a*) Atmospheric storage tanks shall be adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank or exceeding the design pressure in the case of other atmospheric tanks, as a result of filling or emptying, and atmospheric temperature changes.

(*b*) Normal vents shall be sized either in accordance with: (*1*) the American Petroleum Institute Standard 2000 (1968), Venting Atmospheric and Low-Pressure Storage Tanks; or (*2*) other accepted standard; or (*3*) shall be at least as large as the filling or withdrawal connection, whichever is larger but in no case less than 1¼ inch nominal inside diameter.

(*c*) Low-pressure tanks and pressure vessels shall be adequately vented to prevent development of pressure or vacuum, as a result of filling or emptying and atmospheric temperature changes, from exceeding the design pressure of the tank or vessel. Protection shall also be provided to prevent overpressure from any pump discharging into the tank or vessel when the pump discharge pressure can exceed the design pressure of the tank or vessel.

(*d*) If any tank or pressure vessel has more than one fill or withdrawal connection and simultaneous filling or withdrawal can be made, the vent size shall be based on the maximum anticipated simultaneous flow.

(*e*) Unless the vent is designed to limit the internal pressure 2.5 p.s.i. or less, the outlet of vents and vent drains shall be arranged to discharge in such a manner as to prevent localized overheating of any part of the tank in the event vapors from such vents are ignited.

(*f*) Tanks and pressure vessels storing Class IA liquids shall be equipped with venting devices which shall be normally closed except when venting to pressure or vacuum conditions. Tanks and pressure vessels storing Class IB and IC liquids shall be equipped with venting devices which shall be normally closed except when venting under pressure or vacuum conditions, or with approved flame arresters.

Exemption: Tanks of 3,000 bbls. capacity or less containing crude petroleum in crude-producing areas; and, outside aboveground atmospheric tanks under 1,000 gallons capacity containing other than Class IA flammable liquids may have open vents. (See subdivision (vi) (*b*) of this subparagraph.)

(*g*) Flame arresters or venting devices required in subdivision (*f*) of this subdivision may be omitted for Class IB and IC liquids where conditions are such that their use may, in case of obstruction, result in tank damage.

(v) *Emergency relief venting for fire exposure for aboveground tanks.* (*a*) Every aboveground storage tank shall have some form of construction or device that will relieve excessive internal pressure caused by exposure fires.

(*b*) In a vertical tank the construction referred to in subdivision (*a*) of this subdivision may take the form of a floating roof, lifter roof, a weak roof-to-shell seam, or other approved pressure relieving construction. The weak roof-to-shell seam shall be constructed to fail preferential to any other seam.

(*c*) Where entire dependence for emergency relief is placed upon pressure relieving devices, the total venting capacity of both normal and emergency vents shall be enough to prevent rupture of the shell or bottom of the tank if vertical, or of the shell or heads if horizontal. If unstable liquids are stored, the effects of heat or gas resulting from polymerization, decomposition, condensation, or self-reactivity shall be taken into account. The total capacity of both normal and emergency venting devices shall be not less than that derived from Table H-10 except as provided in subdivision (*e*) or (*f*) of this subdivision. Such device may be a self-closing manhole cover, or one using long bolts that permit the cover to lift under internal pressure, or an additional or larger relief valve or valves. The wetted area of the tank shall be calculated on the basis of 55 percent of the total exposed area of a sphere or spheroid, 75 percent of the total exposed area of a horizontal tank and the first 30 feet above grade of the exposed shell area of a vertical tank.

TABLE H-10—WETTED AREA VERSUS CUBIC FEET FREE AIR PER HOUR

(14.7 psia and 60° F.)

Square feet	CFH	Square feet	CFH	Square feet	CFH
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800 and over	742,000
100	105,000	800	462,000		
120	126,000	900	493,000		
140	147,000	1,000	524,000		
160	168,000				
180	190,000				
200	211,000				

(*d*) For tanks and storage vessels designed for pressure over 1 p.s.i.g., the total rate of venting shall be determined in accordance with Table H-10, except that when the exposed wetted area of the surface is greater than 2,800 square feet, the total rate of venting shall be calculated by the following formula:

$$CFH=1{,}107A^{0.82}$$

Where:

CFH=Venting requirement, in cubic feet of free air per hour.

A=Exposed wetted surface, in square feet.

NOTE: The foregoing formula is based on $Q=21{,}000A^{0.82}$.

(*e*) The total emergency relief venting capacity for any specific stable liquid may be determined by the following formula:

$$V=\frac{1337}{L\sqrt{M}}$$

V=Cubic feet of free air per hour from Table H-10.

L=Latent heat of vaporization of specific liquid in B.t.u. per pound.

M=Molecular weight of specific liquids.

(*f*) The required airflow rate of subdivision (*c*) or (*e*) of this subdivision may be multiplied by the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor may be used for any one tank.

0.5 for drainage in accordance with subdivision (vii) (*b*) of this subparagraph for tanks over 200 square feet of wetted area.

0.3 for approved water spray.

0.3 for approved insulation.

0.15 for approved water spray with approved insulation.

(*g*) The outlet of all vents and vent drains on tanks equipped with emergency venting to permit pressures exceeding 2.5 p.s.i.g. shall be arranged to discharge in such a way as to prevent localized overheating of any part of the tank, in the event vapors from such vents are ignited.

(*h*) Each commercial tank venting device shall have stamped on it the opening pressure, the pressure at which the valve reaches the full open position, and the flow capacity at the latter pressure, expressed in cubic feet per hour of air at 60° F. and at a pressure of 14.7 p.s.i.a.

(*i*) The flow capacity of tank venting devices 12 inches and smaller in nominal pipe size shall be determined by actual test of each type and size of vent. These flow tests may be conducted by the manufacturer if certified by a qualified impartial observer, or may be conducted by an outside agency. The flow capacity of tank venting devices larger than 12 inches nominal pipe size, including manhole covers with long bolts or equivalent, may be calculated provided that the opening pressure is actually measured, the rating pressure and corresponding free orifice area are stated, the word "calculated" appears on the nameplate, and the computation is based on a flow coefficient of 0.5 applied to the rated orifice area.

(vi) *Vent piping for aboveground tanks.* (*a*) Vent piping shall be constructed in accordance with paragraph (c) of this section.

(*b*) Where vent pipe outlets for tanks storing Class I liquids are adjacent to buildings or public ways, they shall be located so that the vapors are released at a safe point outside of buildings and not less than 12 feet above the adjacent ground level. In order to aid their dispersion, vapors shall be discharged upward or horizontally away from closely adjacent walls. Vent outlets shall be located so that flammable vapors will not be trapped by eaves or other obstructions and shall be at least five feet from building openings.

(*c*) When tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are subject to the same fire exposure.

(vii) *Drainage, dikes, and walls for aboveground tanks*—(*a*) *Drainage and diked areas.* The area surrounding a tank or a group of tanks shall be provided with drainage as in subdivision (*b*) of this subdivision, or shall be diked as provided in subdivision (*c*) of this subdivision, to prevent accidental discharge of liquid from endangering adjoining property or reaching waterways.

(*b*) *Drainage.* Where protection of adjoining property or waterways is by means of a natural or manmade drainage system, such systems shall comply with the following:

(*1*) A slope of not less than 1 percent away from the tank toward the drainage system shall be provided.

(*2*) The drainage system shall terminate in vacant land or other area or in an impounding basin having a capacity not smaller than that of the largest tank served. This termination area and the route of the drainage system shall be so located that, if the flammable or combustible liquids in the drainage system are ignited, the fire will not seriously expose tanks or adjoining property.

(*3*) The drainage system, including automatic drainage pumps, shall not discharge to adjoining property, natural water courses, public sewers, or public drains unless the discharge of flammable or combustible liquids would not constitute a hazard, or the system is so designed that it will not permit flammable or combustible liquids to be released.

(*c*) *Diked areas.* Where protection of adjoining property or waterways is accomplished by retaining the liquid around the tank by means of a dike, the volume of the diked area shall comply with the following requirements:

(*1*) Except as provided in subdivision (*2*) of this subdivision, the volumetric capacity of the diked area shall not be less than the greatest amount of liquid that can be released from the largest tank within the diked area, assuming a full tank. The capacity of the diked area enclosing more than one tank shall be calculated by deducting the volume of the tanks other than the largest tank below the height of the dike.

(*2*) For a tank or group of tanks with fixed roofs containing crude petroleum with boilover characteristics, the volumetric capacity of the diked area shall be not less than the capacity of the largest tank served by the enclosure, assuming a full tank. The capacity of the diked enclosure shall be calculated by deducting the volume below the height of the dike of all tanks within the enclosure.

(*3*) Walls of the diked area shall be of earth, steel, concrete or solid masonry designed to be liquidtight and to withstand a full hydrostatic head. Earthen walls 3 feet or more in height shall have a flat section at the top not less than 2 feet wide. The slope of an earthen wall shall be consistent with the angle of repose of the material of which the wall is constructed.

(*4*) The walls of the diked area shall be restricted to an average height of 6 feet above interior grade.

(*5*) Where provision is made for draining water from diked areas, drainage shall be provided at a uniform slope of not less than 1 percent away from tanks toward a sump, drainbox, or other safe means of disposal located at the greatest practical distance from the tank. Such drains shall normally be controlled in a manner so as to prevent flammable or combustible liquids from entering natural water courses, public sewers, or public drains, if their presence would constitute a hazard. Control of drainage shall be accessible under fire conditions.

(*6*) No loose combustible material, empty or full drum or barrel, shall be permitted within the diked area.

(*7*) Each diked area containing two or more tanks shall be subdivided preferably by drainage channels or at least by intermediate curbs in order to prevent spills from endangering adjacent tanks within the diked area as follows:

(*i*) When storing normally stable liquids in vertical cone roof tanks constructed with weak roof-to-shell seam or approved floating roof tanks or when storing crude petroleum in producing areas in any type of tank, one subdivision for each tank in excess of 10,000 bbls. and one subdivision for each group of tanks (no tank exceeding 10,000 bbls. capacity) having an aggregate capacity not exceeding 15,000 bbls.

(*ii*) When storing normally stable flammable or combustible liquids in tanks not covered in subdivision (*i*) of this subdivision, one subdivision for each tank in excess of 100,000 gallons (2,500 bbls.) and one subdivision for each group of tanks (no tank exceeding 100,000 gallons capacity) having an aggregate capacity not exceeding 150,000 gallons (3,570 bbls.).

(*iii*) When storing unstable liquids in any type of tank, one subdivision for each tank except that tanks installed in accordance with the drainage requirements of NFPA 15-1969, Standard for Water Spray Fixed Systems for Fire Protection shall require no additional subdivision.

(*iv*) The drainage channels or intermediate curbs shall be located between tanks so as to take full advantage of the available space with due regard for the individual tank capacities. Intermediate curbs, where used, shall be not less than 18 inches in height.

(viii) *Tank openings other than vents for aboveground tanks.* (*a*) Connections for all tank openings shall be vaportight and liquidtight. Vents are covered in subdivisions (iv) through (vi) of this subparagraph.

(*b*) Each connection to an aboveground tank through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank. Such valves, when external, and their connections to the tank shall be of steel except when the chemical characteristics of the liquid stored are incompatible with steel. When materials other than steel are necessary, they shall be suitable for the pressures, structural stresses, and temperatures involved, including fire exposures.

(*c*) Each connection below the liquid level through which liquid does not normally flow shall be provided with a liquidtight closure. This may be a valve, plug, or blind, or a combination of these.

(*d*) Openings for gaging shall be provided with a vaportight cap or cover.

(*e*) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity. A fill pipe entering the top of a tank shall terminate within 6 inches of the bottom of the tank and shall be installed to avoid excessive vibration.

(*f*) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquidtight when not in use. The connection shall be properly identified.

(3) *Installation of underground tanks*—(i) *Location.* Excavation for underground storage tanks shall be made with due care to avoid undermining of foundations of existing structures. Underground tanks or tanks under buildings shall be so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transmitted to the tank. The distance from any part of a tank storing Class I liquids to the nearest wall of any basement or pit shall be not less than 1 foot, and to any property line that may be built upon, not less than 3 feet. The distance from any part of a tank storing Class II or Class III liquids to the nearest wall of any basement, pit or property line shall be not less than 1 foot.

(ii) *Depth and cover.* Underground tanks shall be set on firm foundations and surrounded with at least 6 inches of noncorrosive, inert materials such as clean sand, earth, or gravel well tamped in place. The tank shall be placed in the hole with care since dropping or rolling the tank into the hole can break a weld, puncture or damage the tank, or scrape off the protective coating of coated tanks. Tanks shall be covered with a minimum of 2 feet of earth, or shall be covered with not less than 1 foot of earth, on top of which shall be placed a slab of reinforced concrete not less than 4 inches thick. When underground tanks are, or are likely to be, subject to traffic, they shall be protected against damage from vehicles passing over them by at least 3 feet of earth cover, or 18 inches of well-tamped earth, plus 6 inches of reinforced concrete or 8 inches of asphaltic concrete. When asphaltic or reinforced concrete paving is used as part of the protection, it shall extend at least 1 foot horizontally beyond the outline of the tank in all directions.

(iii) *Corrosion protection.* Corrosion protection for the tank and its piping shall be provided by one or more of the following methods:

(*a*) Use of protective coatings or wrappings;

(*b*) Cathodic protection; or,

(*c*) Corrosion resistant materials of construction.

(iv) *Vents.* (*a*) Location and arrangement of vents for Class I liquids. Vent pipes from tanks storing Class I liquids shall be so located that the discharge point is outside of buildings, higher than the fill pipe opening, and not less than 12 feet above the adjacent ground level. Vent pipes shall discharge only upward in order to disperse vapors. Vent pipes 2 inches or less in nominal inside diameter shall not be obstructed by devices that will cause excessive back pressure. Vent pipe outlets shall be so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions. If the vent pipe is less than 10 feet in length, or greater than 2 inches in nominal inside diameter, the outlet shall be provided with a vacuum and pressure relief device or there shall be an approved flame arrester located in the vent line at the outlet or within the approved distance from the outlet.

(*b*) Size of vents. Each tank shall be vented through piping adequate in size to prevent blow-back of vapor or liquid at the fill opening while the tank is being filled. Vent pipes shall be not less than 1¼ inch nominal inside diameter.

TABLE H-11—VENT LINE DIAMETERS

Maximum flow GPM	Pipe length*		
	50 feet	100 feet	200 feet
	Inches	*Inches*	*Inches*
100	1¼	1¼	1¼
200	1¼	1¼	1¼
300	1¼	1¼	1½
400	1¼	1½	2
500	1½	1½	2
600	1½	2	2
700	2	2	2
800	2	2	3
900	2	2	3
1,000	2	2	3

*Vent lines of 50 ft., 100 ft., and 200 ft. of pipe plus 7 ells.

(*c*) Location and arrangement of vents for Class II or Class III liquids. Vent pipes from tanks storing Class II or Class III flammable liquids shall terminate outside of the building and higher than the fill pipe opening. Vent outlets shall be above normal snow level. They may be fitted with return bends, coarse screens or other devices to minimize ingress of foreign material.

(*d*) Vent piping shall be constructed in accordance with paragraph (c) of this section. Vent pipes shall be so laid as to drain toward the tank without sags or traps in which liquid can collect. They shall be located so that they will not be subjected to physical damage. The tank end of the vent pipe shall enter the tank through the top.

(*e*) When tank vent piping is manifolded, pipe sizes shall be such as to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are filled simultaneously.

(v) *Tank openings other than vents.* (*a*) Connections for all tank openings shall be vapor or liquid tight.

(*b*) Openings for manual gaging, if independent of the fill pipe, shall be provided with a liquid-tight cap or cover. If inside a building, each such opening shall be protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device.

(*c*) Fill and discharge lines shall enter tanks only through the top. Fill lines shall be sloped toward the tank.

(*d*) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

(*e*) Filling and emptying connections which are made and broken shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. Such connection shall be closed and liquidtight when not in use. The connection shall be properly identified.

(4) *Installation of tanks inside of buildings*—(i) *Location.* Tanks shall not be permitted inside of buildings except as provided in paragraphs (e), (g), (h), or (i) of this section.

(ii) *Vents.* Vents for tanks inside of buildings shall be as provided in subparagraphs (2) (iv), (v), (vi)(*b*), and (3)(iv) of this paragraph, except that emergency venting by the use of weak roof seams on tanks shall not be permitted. Vents shall discharge vapors outside the buildings.

(iii) *Vent piping.* Vent piping shall be constructed in accordance with paragraph (c) of this section.

(iv) *Tank openings other than vents.* (*a*) Connections for all tank openings shall be vapor or liquidtight. Vents are covered in subdivision (ii) of this subparagraph.

(*b*) Each connection to a tank inside of buildings through which liquid can normally flow shall be provided with an internal or an external valve located as close as practical to the shell of the tank. Such valves, when external, and their connections to the tank shall be of steel except when the chemical characteristics of the liquid stored are incompatible with steel. When materials other than steel are necessary, they shall be suitable for the pressures, structural stresses, and temperatures involved, including fire exposures.

(*c*) Flammable or combustible liquid tanks located inside of buildings, except in one-story buildings designed and protected for flammable or combustible liquid storage, shall be provided with an automatic-closing heat-actuated valve on each withdrawal connection below the liquid level, except for connections used for emergency disposal, to prevent continued flow in the event of fire in the vicinity of the tank. This function may be incorporated in the valve required in (*b*) of this subdivision, and if a separate valve, shall be located adjacent to the valve required in (*b*) of this subdivision.

(*d*) Openings for manual gaging, if independent of the fill pipe (see (*f*) of this subdivision), shall be provided with a vaportight cap or cover. Each such opening shall be protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device.

(*e*) For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, the fill pipe shall be so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank.

(*f*) The fill pipe inside of the tank shall be installed to avoid excessive vibration of the pipe.

(*g*) The inlet of the fill pipe shall be located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening. The inlet of the fill pipe shall be closed and liquidtight when not in use. The fill connection shall be properly identified.

(*h*) Tanks inside buildings shall be equipped with a device, or other means shall be provided, to prevent overflow into the building.

(5) *Supports, foundations, and anchorage for all tank locations*—(i) *General.* Tank supports shall be installed on firm foundations. Tank supports shall be of concrete, masonry, or protected steel. Single wood timber supports (not cribbing) laid horizontally may be used for outside aboveground tanks if not more than 12 inches high at their lowest point.

(ii) *Fire resistance.* Steel supports or exposed piling shall be protected by materials having a fire resistance rating of not less than 2 hours, except that steel saddles need not be protected if less than 12 inches high at their lowest point. Water spray protection or its equivalent may be used in lieu of fire-resistive materials to protect supports.

(iii) *Spheres.* The design of the supporting structure for tanks such as spheres shall receive special engineering consideration.

(iv) *Load distribution.* Every tank shall be so supported as to prevent the excessive concentration of loads on the supporting portion of the shell.

(v) *Foundations.* Tanks shall rest on the ground or on foundations made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation.

(vi) *Flood areas.* Where a tank is located in an area that may be subjected to flooding, the applicable precautions outlined in this subdivision shall be observed.

(*a*) No aboveground vertical storage tank containing a flammable or combustible liquid shall be located so that the allowable liquid level within the tank is below the established maximum flood stage, unless the tank is provided with a guiding structure such as described in (*m*), (*n*), and (*o*) of this subdivision.

(*b*) Independent water supply facilities shall be provided at locations where there is no ample and dependable public water supply available for loading partially empty tanks with water.

(*c*) In addition to the preceding requirements, each tank so located that more than 70 percent, but less than 100 percent, of its allowable liquid storage capacity will be submerged at the established maximum flood stage, shall be safeguarded by one of the following methods: Tank shall be raised, or its height shall be increased, until its top extends above the maximum flood stage a distance equivalent to 30 percent or more of its allowable liquid storage capacity: *Provided, however,* That the submerged part of the tank shall not exceed two and one-half times the diameter. Or, as an alternative to the foregoing, adequate noncombustible structural guides, designed to permit the tank to float vertically without loss of product, shall be provided.

(*d*) Each horizontal tank so located that more than 70 percent of its storage capacity will be submerged at the established flood stage, shall be anchored, attached to a foundation of concrete or of steel and concrete, of sufficient weight to provide adequate load for the tank when filled with flammable or combustible liquid and submerged by flood waters to the established flood stage, or adequately secured by other means.

(*e*) Spherical and spheroidal tanks shall be protected by applicable methods as specified for either vertical or horizontal tanks.

(*f*) At locations where there is no ample and dependable water supply, or where filling of underground tanks with liquids is impracticable because of the character of their contents, their use, or for other reasons, each tank shall be safeguarded against movement when empty and submerged by high ground water or flood waters by anchoring, weighting with concrete or other approved solid loading material, or securing by other means. Each such tank shall be so constructed and installed that it will safely resist external pressures due to high ground water or flood waters.

(*g*) At locations where there is an ample and dependable water supply available, underground tanks containing flammable or combustible liquids, so installed that more than 70 percent of their storage capacity will be submerged at the maximum flood stage, shall be so anchored, weighted, or secured by other means, as to prevent movement of such tanks when filled with flammable or combustible liquids, and submerged by flood waters to the established flood stage.

(*h*) Pipe connections below the allowable liquid level in a tank shall be provided with valves or cocks located as closely as practicable to the tank shell. Such valves and their connections to tanks shall be of steel or other material suitable for use with the liquid being stored. Cast iron shall not be permitted.

(*i*) At locations where an independent water supply is required, it shall be entirely independent of public power and water supply. Independent source of water shall be available when flood waters reach a level not less than 10 feet below the bottom of the lowest tank on a property.

(*j*) The self-contained power and pumping unit shall be so located or so designed that pumping into tanks may be carried on continuously throughout the rise in flood waters from a level 10 feet below the lowest tank to the level of the potential flood stage.

(*k*) Capacity of the pumping unit shall be such that the rate of rise of water in all tanks shall be equivalent to the established potential average rate of rise of flood waters at any stage.

(*l*) Each independent pumping unit shall be tested periodically to insure that it is in satisfactory operating condition.

(*m*) Structural guides for holding floating tanks above their foundations shall be so designed that there will be no resistance to the free rise of a tank, and shall be constructed of noncombustible material.

(*n*) The strength of the structure shall be adequate to resist lateral movement of a tank subject to a horizontal force in any direction equivalent to not less than 25 pounds per square foot acting on the projected vertical cross-sectional area of the tank.

(*o*) Where tanks are situated on exposed points or bends in a shoreline where swift currents in flood waters will be present, the structures shall be designed to withstand a unit force of not less than 50 pounds per square foot.

(*p*) The filling of a tank to be protected by water loading shall be started as soon as flood waters reach a dangerous flood stage. The rate of filling shall be at least equal to the rate of rise of the floodwaters (or the established average potential rate of rise).

(*q*) Sufficient fuel to operate the water pumps shall be available at all times to insure adequate power to fill all tankage with water.

(*r*) All valves on connecting pipelines shall be closed and locked in closed position when water loading has been completed.

(*s*) Where structural guides are provided for the protection of floating tanks, all rigid connections between tanks and pipelines shall be disconnected and blanked off or blinded before the floodwaters reach the bottom of the tank, unless control valves and their connections to the tank are of a type designed to prevent breakage between the valve and the tank shell.

(*t*) All valves attached to tanks other than those used in connection with water loading operations shall be closed and locked.

(*u*) If a tank is equipped with a swing line, the swing pipe shall be raised to and secured at its highest position.

(*v*) Inspections. The Assistant Secretary or his designated representative shall make periodic inspections of all plants where the storage of flammable or combustible liquids is such as to require compliance with the foregoing requirements, in order to assure the following:

(*1*) That all flammable or combustible liquid storage tanks are in compliance with these requirements and so maintained.

(*2*) That detailed printed instructions of what to do in flood emergencies are properly posted.

(*3*) That station operators and other employees depended upon to carry out such instructions are thoroughly informed as to the location and operation of such valves and other equipment necessary to effect these requirements.

(vii) *Earthquake areas.* In areas subject to earthquakes, the tank supports and connections shall be designed to resist damage as a result of such shocks.

(6) *Sources of ignition.* In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.

(7) *Testing*—(i) *General.* All tanks, whether shop built or field erected, shall be strength tested before they are placed in service in accordance with the applicable paragraphs of the code under which they were built. The American Society of Mechanical Engineers (ASME) code stamp, American Petroleum Institute (API) monogram, or the label of the Underwriters' Laboratories, Inc., on a tank shall be evidence of compliance with this strength test. Tanks not marked in accordance with the above codes shall be strength tested before they are placed in service in accordance with good engineering principles and reference shall be made to the sections on testing in the codes listed in subparagraphs (1) (iii) (*a*), (iv) (*b*), or (v) (*b*) of this paragraph.

(ii) *Strength.* When the vertical length of the fill and vent pipes is such that when filled with liquid the static head imposed upon the bottom of the tank exceeds 10 pounds per square inch, the tank and related piping shall be tested hydrostatically to a pressure equal to the static head thus imposed.

(iii) *Tightness.* In addition to the strength test called for in subdivisions (i) and (ii) of this subparagraph, all tanks and connections shall be tested for tightness. Except for underground tanks, this tightness test shall be made at operating pressure with air, inert gas, or water prior to placing the tank in service. In the case of field-erected tanks the strength test may be considered to be the test for tank tightness. Underground tanks and piping, before being covered, enclosed, or placed in use, shall be tested for tightness hydrostatically, or with air pressure at not less than 3 pounds per square inch and not more than 5 pounds per square inch.

(iv) *Repairs.* All leaks or deformations shall be corrected in an acceptable manner before the tank is placed in service. Mechanical caulking is not permitted for correcting leaks in welded tanks except pinhole leaks in the roof.

(v) *Derated operations.* Tanks to be operated at pressures below their design pressure may be tested by the applicable provisions of subdivisions (i) or (ii) of this subparagraph, based upon the pressure developed under full emergency venting of the tank.

(c) *Piping, valves, and fittings*—(1) *General*—(i) *Design.* The design (including selection of materials) fabrication, assembly, test, and inspection of piping systems containing flammable or combustible liquids shall be suitable for the expected working pressures and structural stresses. Conformity with the applicable provisions of Pressure Piping, ANSI B31 series and the provisions of this paragraph, shall be considered prima facie evidence of compliance with the foregoing provisions.

(ii) *Exceptions.* This paragraph does not apply to any of the following:

(*a*) Tubing or casing on any oil or gas wells and any piping connected directly thereto.

(*b*) Motor vehicle, aircraft, boat, or portable or stationary engines.

(*c*) Piping within the scope of any applicable boiler and pressures vessel code.

(iii) *Definitions.* As used in this paragraph, piping systems consist of pipe, tubing, flanges, bolting, gaskets, valves, fittings, the pressure containing parts of other components such as expansion joints and strainers, and devices which serve such purposes as mixing, separating, snubbing, distributing, metering, or controlling flow.

(2) *Materials for piping, valves, and fittings*—(i) *Required materials.* Materials for piping, valves, or fittings shall be steel or nodular iron except as provided in subdivisions (ii), (iii), and (iv) of this subparagraph.

(ii) *Exceptions.* Materials other than steel or nodular iron may be used underground or if required by the properties of the flammable or combustible liquid handled. Material other than steel or nodular iron shall be designed to specifications embodying principles recognized as good engineering design for the material used.

(iii) *Linings.* Piping, valves, and fittings may have combustible or noncombustible linings.

(iv) *Low-melting materials.* When low-melting point materials such as aluminum and brass or materials that soften on fire exposure such as plastics, or nonductile materials such as cast iron, are necessary, special consideration shall be given to their behavior on fire exposure. If such materials are used in aboveground piping systems or inside buildings, they shall be suitably protected against fire exposure or so located that any spill resulting from the failure of these materials could not unduly expose persons, important buildings or structures or can be readily controlled by remote valves.

(3) *Pipe joints.* Joints shall be made liquid tight. Welded or screwed joints or

approved connectors shall be used. Threaded joints and connections shall be made up tight with a suitable lubricant or piping compound. Pipe joints dependent upon the friction characteristics of combustible materials for mechanical continuity of piping shall not be used inside buildings. They may be used outside of buildings above or below ground. If used aboveground, the piping shall either be secured to prevent disengagement at the fitting or the piping system shall be so designed that any spill resulting from such disengagement could not unduly expose persons, important buildings or structures, and could be readily controlled by remote valves.

(4) *Supports.* Piping systems shall be substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion, or contraction.

(5) *Protection against corrosion.* All piping for flammable or combustible liquids, both aboveground and underground, where subject to external corrosion, shall be painted or otherwise protected.

(6) *Valves.* Piping systems shall contain a sufficient number of valves to operate the system properly and to protect the plant. Piping systems in connection with pumps shall contain a sufficient number of valves to control properly the flow of liquid in normal operation and in the event of physical damage. Each connection to pipelines, by which equipments such as tankcars or tank vehicles discharge liquids by means of pumps into storage tanks, shall be provided with a check valve for automatic protection against backflow if the piping arrangement is such that backflow from the system is possible.

(7) *Testing.* All piping before being covered, enclosed, or placed in use shall be hydrostatically tested to 150 percent of the maximum anticipated pressure of the system, or pneumatically tested to 110 percent of the maximum anticipated pressure of the system, but not less than 5 pounds per square inch gage at the highest point of the system. This test shall be maintained for a sufficient time to complete visual inspection of all joints and connections, but for at least 10 minutes.

(d) *Container and portable tank storage*—(1) *Scope*—(i) *General.* This paragraph shall apply only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and those portable tanks not exceeding 660 gallons individual capacity.

(ii) *Exceptions.* This paragraph shall not apply to the following:

(*a*) Storage of containers in bulk plants, service stations, refineries, chemical plants, and distilleries;

(*b*) Flammable liquids in the fuel tanks of a motor vehicle, aircraft, boat, or portable or stationary engine;

(*c*) Flammable or combustible paints, oils, varnishes, and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days.

(*d*) Beverages when packaged in individual containers not exceeding 1 gallon in size.

(2) *Design, construction, and capacity of containers*—(i) *General.* Only approved containers and portable tanks shall be used. Metal containers and portable tanks meeting the requirements of and containing products authorized by Chapter I, Title 49 of the Code of Federal Regulations (regulations issued by the Hazardous Materials Regulations Board, Department of Transportation), shall be deemed to be acceptable.

(ii) *Emergency venting.* Each portable tank shall be provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 p.s.i.g., or 30 percent of the bursting pressure of the tank, whichever is greater. The total venting capacity shall be not less than that specified in paragraphs (b)(2)(v) (*c*) or (*e*) of this section. At least one pressure-actuated vent having a minimum capacity of 6,000 cubic feet of free air (14.7 p.s.i.a. and 60° F.) shall be used. It shall be set to open at not less than 5 p.s.i.g. If fusible vents are used, they shall be actuated by elements that operate at a temperature not exceeding 300° F.

TABLE H-12—MAXIMUM ALLOWABLE SIZE OF CONTAINERS AND PORTABLE TANKS

Container type	Flammable liquids				Combustible liquids, Class III
	Class IA	Class IB	Class IC	Class II	
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal.
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal.
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal.
Metal drums (DOT spec.)	60 gal	60 gal	60 gal	60 gal	60 gal.
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal.

Container exemptions: (a) Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of § 1910.166 (d) (2) (i) and (ii).

(iii) *Size.* Flammable and combustible liquid containers shall be in accordance with Table H-12, except that glass or plastic containers of no more than 1-gallon capacity may be used for a Class IA or IB flammable liquid if:

(*a*) (*1*) Such liquid either would be rendered unfit for its intended use by contact with metal or would excessively corrode a metal container so as to create a leakage hazard; and

(*2*) The user's process either would require more than 1 pint of a Class IA liquid or more than 1 quart of a Class IB liquid of a single assay lot to be used at one time, or would require the maintenance of an analytical standard liquid of a quality which is not met by the specified standards of liquids available, and the quantity of the analytical standard liquid required to be used in any one control process exceeds one-sixteenth the capacity of the container allowed under Table H-12 for the class of liquid; or

(*b*) The containers are intended for direct export outside the United States.

(3) *Design, construction, and capacity of storage cabinets*—(i) *Maximum capacity.* Not more than 60 gallons of flammable or 120 gallons of combustible liquids may be stored in a storage cabinet.

(ii) *Fire resistance.* Storage cabinets shall be designed and constructed to limit the internal temperature to not more than 325° F. when subjected to a 10-minute fire test using the standard time-temperature curve as set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251–1969. All joints and seams shall remain tight and the door shall remain securely closed during the fire test. Cabinets shall be labeled in conspicuous lettering, "Flammable—Keep Fire Away."

(*a*) Metal cabinets constructed in the following manner shall be deemed to be in compliance. The bottom, top, door, and sides of cabinet shall be at least No. 18 gage sheet iron and double walled with 1½-inch air space. Joints shall be riveted, welded or made tight by some equally effective means. The door shall be provided with a three-point lock, and the door sill shall be raised at least 2 inches above the bottom of the cabinet.

(*b*) Wooden cabinets constructed in the following manner shall be deemed in compliance. The bottom, sides, and top shall be constructed of an approved grade of plywood at least 1 inch in thickness, which shall not break down or delaminate under fire conditions. All joints shall be rabbetted and shall be fastened in two directions with flathead woodscrews. When more than one door is used, there shall be a rabbetted overlap of not less than 1 inch. Hinges shall be mounted in such a manner as not to lose their holding capacity due to loosening or burning out of the screws when subjected to the fire test.

(4) *Design and construction of inside storage rooms*—(i) *Construction.* Inside storage rooms shall be constructed to meet the required fire-resistive rating for their use. Such construction shall comply with the test specifications set forth in Standard Methods of Fire Tests of Building Construction and Materials, NFPA 251–1969. Where an automatic sprinkler system is provided, the system shall be designed and installed in an acceptable manner. Openings to other rooms or buildings shall be provided with noncombustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the surrounding floor. Openings shall be provided with approved self-closing fire doors. The room shall be liquid-tight where the walls join the floor. A permissible alternate to the sill or ramp is an open-grated trench inside of the room which drains to a safe location. Where other portions of the building or other properties are exposed,

windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80–1968, for Class E or F openings. Wood at least 1 inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations.

(ii) *Rating and capacity.* Storage in inside storage rooms shall comply with Table H–13.

TABLE H–13—STORAGE IN INSIDE ROOMS

Fire protection* provided	Fire resistance	Maximum size	Total allowable quantities (gals./sq ft./floor area)
Yes	2 hours	500 sq. ft.	10
No	2 hours	500 sq. ft.	4
Yes	1 hour	150 sq. ft.	5
No	1 hour	150 sq. ft.	2

*Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

(iii) *Wiring.* Electrical wiring and equipment located in inside storage rooms used for Class I liquids shall be approved under subpart S of this part for Class I, Division 2 Hazardous Locations; for Class II and Class III liquids, shall be approved for general use.

(iv) *Ventilation.* Every inside storage room shall be provided with either a gravity or a mechanical exhaust ventilation system. Such system shall be designed to provide for a complete change of air within the room at least six times per hour. If a mechanical exhaust system is used, it shall be controlled by a switch located outside of the door. The ventilating equipment and any lighting fixtures shall be operated by the same switch. A pilot light shall be installed adjacent to the switch if Class I flammable liquids are dispensed within the room. Where gravity ventilation is provided, the fresh air intake, as well as the exhaust outlet from the room, shall be on the exterior of the building in which the room is located.

(v) *Storage in inside storage rooms.* In every inside storage room there shall be maintained one clear aisle at least 3 feet wide. Containers over 30 gallons capacity shall not be stacked one upon the other. Dispensing shall be by approved pump or self-closing faucet only.

(5) *Storage inside building*—(i) *Egress.* Flammable or combustible liquids, including stock for sale, shall not be stored so as to limit use of exits, stairways, or areas normally used for the safe egress of people.

(ii) *Containers.* The storage of flammable or combustible liquids in containers or portable tanks shall comply with subdivisions (iii) through (v) of this subparagraph.

(iii) *Office occupancies.* Storage shall be prohibited except that which is required for maintenance and operation of building and operation of equipment. Such storage shall be kept in closed metal containers stored in a storage cabinet or in safety cans or in an inside storage room not having a door that opens into that portion of the building used by the public.

(iv) *Mercantile occupancies and other retail stores.*

(*a*) In rooms or areas accessible to the public, storage shall be limited to quantities needed for display and normal merchandising purposes but shall not exceed 2 gallons per square foot of gross floor area. The gross floor area used for computing the maximum quantity permitted shall be considered as that portion of the store actually being used for merchandising flammable and combustible liquids.

(*b*) Where the aggregate quantity of additional stock exceeds 60 gallons of Class IA, 120 gallons of Class IB, 180 gallons of Class IC, 240 gallons of Class II, or 500 gallons of combustible liquids, or any combination of flammable liquids exceeding 240 gallons, it shall be stored in a room or portion of the building that complies with the construction provisions for an inside storage room as prescribed in subparagraph (4) of this paragraph. For water miscible liquids, these quantities may be doubled.

(*c*) Containers in a display area shall not be stacked more than 3 feet or two containers high, whichever is the greater, unless the stacking is done on fixed shelving or is otherwise satisfactorily secured.

(*d*) Shelving shall be of stable construction, of sufficient depth and arrangement such that containers displayed thereon shall not be easily displaced.

(*e*) Leaking containers shall be removed to a storage room or taken to a safe location outside the building and the contents transferred to an undamaged container.

(v) *General purpose public warehouses.* Storage shall be in accordance with Table H–14 or H–15 and in buildings or in portions of such buildings cut off by standard firewalls. Material creating no fire exposure hazard to the flammable or combustible liquids may be stored in the same area.

TABLE H–14—INDOOR CONTAINER STORAGE

Class liquid	Storage level	Protected storage maximum per pile		Unprotected storage maximum per pile	
		Gallons	Height	Gallons	Height
IA	Ground and upper floors	2,750 (50)	3 ft. (1)	660 (12)	3 ft. (1)
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	5,500 (100)	6 ft. (2)	1,375 (25)	3 ft. (1)
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	16,500 (300)	6 ft. (2)	4,125 (75)	3 ft. (1)
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	16,500 (300)	9 ft. (3)	4,125 (75)	9 ft. (3)
	Basement	5,500 (100)	9 ft. (3)	Not permitted	
Combustible	Ground and upper floors	55,000 (1,000)	15 ft. (5)	13,750 (250)	12 ft. (4)
	Basement	8,250 (450)	9 ft. (3)	Not permitted	

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

NOTE 3: Each pile shall be separated from each other by at least 4 ft.

TABLE H–15—INDOOR PORTABLE TANK STORAGE

Class liquid	Storage level	Protected storage maximum per pile		Unprotected storage maximum per pile	
		Gallons	Height	Gallons	Height
IA	Ground and upper floors	Not permitted		Not permitted	
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	20,000	7 ft.	2,000	7 ft.
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	40,000	14 ft.	5,500	7 ft.
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	40,000	14 ft.	5,500	7 ft.
	Basement	20,000	7 ft.	Not permitted	
Combustible	Ground and upper floors	60,000	14 ft.	22,000	7 ft.
	Basement	20,000	7 ft.	Not permitted	

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no portable tank is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

NOTE 3: Each pile shall be separated from each other by at least 4 ft.

(vi) *Flammable and combustible liquid warehouses or storage buildings.* (*a*) If the storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall shall be a blank wall having a fire-resistance rating of at least 2 hours.

(*b*) The total quantity of liquids within a building shall not be restricted, but the arrangement of storage shall comply with Table H–14 or H–15.

(*c*) Containers in piles shall be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls.

(d) Portable tanks stored over one tier high shall be designed to nest securely, without dunnage, and adequate materials handling equipment shall be available to handle tanks safely at the upper tier level.

(e) No pile shall be closer than 3 feet to the nearest beam, chord, girder, or other obstruction, and shall be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

(f) Aisles of at least 3 feet wide shall be provided where necessary for reasons of access to doors, windows or standpipe connections.

(6) *Storage outside buildings*—(i) *General.* Storage outside buildings shall be in accordance with Table H–16 or H–17, and subdivisions (ii) and (iv) of this subparagraph.

TABLE H-16—OUTDOOR CONTAINER STORAGE

1	2	3	4	5
Class	Maximum per pile (see note 1)	Distance between piles (see note 2)	Distance to property line that can be built upon (see notes 3 and 4)	Distance to street, alley, public way (see note 4)
	gal.	*ft.*	*ft.*	*ft.*
IA	1, 100	5	20	10
IB	2, 200	5	20	10
IC	4, 400	5	20	10
II	8, 800	5	10	5
Combustible	22, 000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shal be the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each container, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

(ii) *Maximum storage.* A maximum of 1,100 gallons of flammable or combustible liquids may be located adjacent to buildings located on the same premises and under the same management provided the provisions of subdivisions *(a)* and *(b)* of this subdivision are complied with.

(a) The building shall be a one-story building devoted principally to the handling and storing of flammable or combustible liquids or the building shall have 2-hour fire-resistive exterior walls having no opening within 10 feet of such storage.

(b) Where quantity stored exceeds 1,100 gallons, or provisions of subdivision *(a)* of this subdivision cannot be met, a minimum distance of 10 feet between buildings and nearest container of flammable or combustible liquid shall be maintained.

TABLE H-17—OUTDOOR PORTABLE TANK STORAGE

1	2	3	4	5
Class	Maximum per pile	Distance between piles	Distance to property line that can be built upon	Distance to street, alley, public way
	gal.	*ft.*	*ft.*	*ft.*
IA	2, 200	5	20	10
IB	4, 400	5	20	10
IC	8, 800	5	20	10
II	17, 600	5	10	5
Combustible	44, 000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each portable tank, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

(iii) *Spill containment.* The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures or shall be surrounded by a curb at least 6 inches high. When curbs are used, provisions shall be made for draining of accumulations of ground or rain water or spills of flammable or combustible liquids. Drains shall terminate at a safe location and shall be accessible to operation under fire conditions.

(iv) *Security.* The storage area shall be protected against tampering or trespassers where necessary and shall be kept free of weeds, debris and other combustible material not necessary to the storage.

(7) *Fire control*—(i) *Extinguishers.* Suitable fire control devices, such as small hose or portable fire extinguishers, shall be available at locations where flammable or combustible liquids are stored.

(a) At least one portable fire extinguishers having a rating of not less than 12–B units shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage.

(b) At least one portable fire extinguisher having a rating of not less than 12–B units shall be located not less than 10 feet, nor more than 25 feet, from any flammable liquid storage area located outside of a storage room but inside a building.

(ii) *Sprinklers.* When sprinklers are provided, they shall be installed in an approved manner.

(iii) *Open Flames and Smoking.* Open flames and smoking shall not be permitted in flammable or combustible liquid storage areas.

(iv) *Water Reactive Materials.* Materials which will react with water shall not be stored in the same room with flammable or combustible liquids.

(e) *Industrial plants*—(1) *Scope*—(i) *Application.* This paragraph shall apply to those industrial plants where:

(a) The use of flammable or combustible liquids is incidental to the principal business, or

(b) Where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction. This paragraph shall not apply to chemical plants, refineries or distilleries.

(ii) *Exceptions.* Where portions of such plants involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes, those portions of the plant shall be in accordance with paragraph (h) of this section.

(2) *Incidental storage or use of flammable and combustible liquids*—(i) *Application.* This subparagraph shall be applicable to those portions of an industrial plant where the use and handling of flammable or combustible liquids is only incidental to the principal business, such as automobile assembly, construction of electronic equipment, furniture manufacturing, or other similar activities.

(ii) *Containers.* Flammable or combustible liquids shall be stored in tanks or closed containers.

(a) Except as provided in subdivisions *(b)* and *(c)* of this subdivision, all storage shall comply with paragraph (d) (3) or (4) of this section.

(b) The quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building shall not exceed:

(1) 25 gallons of Class IA liquids in containers

(2) 120 gallons of Class IB, IC, II, or III liquids in containers

(3) 660 gallons of Class IB, IC, II, or III liquids in a single portable tank.

(c) Where large quantities of flammable or combustible liquids are necessary, storage may be in tanks which shall comply with the applicable requirements of paragraph (b) of this section.

(iii) *Separation and protection.* Areas in which flammable or combustible liquids are transferred from one tank or container to another container shall be separated from other operations in the building by adequate distance or by construction having adequate fire resistance. Drainage or other means shall be provided to control spills. Adequate natural or mechanical ventilation shall be provided.

(iv) *Handling liquids at point of final use.* (*a*) Flammable liquids shall be kept in covered containers when not actually in use.

(*b*) Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage or spills.

(*c*) Class I liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapor travel.

(*d*) Flammable or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks within a building only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container or portable tanks by gravity through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks shall be prohibited.

(3) *Unit physical operations*—(i) *Application.* This subparagraph shall be applicable in those portions of industrial plants where flammable or combustible liquids are handled or used in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical change. Examples are plants compounding cosmetics, pharmaceuticals, solvents, cleaning fluids, insecticides, and similar types of activities.

(ii) *Location.* Industrial plants shall be located so that each building or unit of equipment is accessible from at least one side for firefighting and fire control purposes. Buildings shall be located with respect to lines of adjoining property which may be built upon as set forth in paragraph (h)(2) (i) and (ii) of this section except that the blank wall referred to in paragraph (h)(2)(ii) of this section shall have a fire resistance rating of at least 2 hours.

(iii) *Chemical processes.* Areas where unstable liquids are handled or small scale unit chemical processes are carried on shall be separated from the remainder of the plant by a fire wall of 2-hour minimum fire resistance rating.

(iv) *Drainage.* (*a*) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire; see paragraph (b)(2)(vii)(*b*) of this section.

(*b*) Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.

(*c*) The industrial plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids into public waterways, public sewers, or adjoining property.

(v) *Ventilation.* (*a*) Areas as defined in subdivision (i) of this subparagraph using Class I liquids shall be ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.

(*b*) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes Class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.

(vi) *Storage and handling.* The storage, transfer, and handling of liquid shall comply with paragraph (h)(4) of this section.

(4) *Tank vehicle and tank car loading and unloading.* (i) Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property which may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of paragraph (f)(3) of this section.

(5) *Fire control*—(i) *Portable and special equipment.* Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

(ii) *Water supply.* Water shall be available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems as the need is indicated by the special hazards of operation, dispensing and storage.

(iii) *Special extinguishers.* Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation dispensing and storage.

(iv) *Special hazards.* Where the need is indicated by special hazards of operation, flammable or combustible liquid processing equipment, major piping, and supporting steel shall be protected by approved water spray systems, deluge systems, approved fire-resistant coatings, insulation, or any combination of these.

(v) *Maintenance.* All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition, and they will serve their purpose in time of emergency.

(6) *Sources of ignition*—(i) *General.* Adequate precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

(ii) *Grounding.* Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.

(7) *Electrical*—(i) *Equipment.* (*a*) All electrical wiring and equipment shall be installed according to the requirements of Subpart S of this part.

(*b*) Locations where flammable vapor-air mixtures may exist under normal operations shall be classified Class I, Division 1 according to the requirements of Subpart S of this part. For those pieces of equipment installed in accordance with subparagraph (3)(v)(*b*) of this paragraph, the Division 1 area shall extend 5 feet in all directions from all points of vapor liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.

(*c*) Locations where flammable vapor-air mixtures may exist under abnormal conditions and for a distance beyond Division 1 locations shall be classified Division 2 according to the requirements of Subpart S of this part. These locations include an area within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling Class I liquids. Pits provided with adequate mechanical ventilation within a Division 1 or 2 area shall be classified Division 2. If Class II or Class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

(*d*) Where the provisions of subdivisions (*a*), (*b*), and (*c*), of this subdivision require the installation of electrical equipment suitable for Class I, Division 1 or Division 2 locations, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation makeup air shall be uncontaminated by flammable vapors.

(8) *Repairs to equipment.* Hot work, such as welding or cutting operations, use of spark-producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge. The individual in responsible charge shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

(9) *Housekeeping*—(i) *General.* Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.

(ii) *Access.* Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of flammable or combustible liquid storage, use, or any unit physical operation.

(iii) *Waste and residue.* Combustible waste material and residues in a building or unit operating area shall be kept to a minimum, stored in covered metal receptacles and disposed of daily.

(iv) *Clear zone.* Ground area around buildings and unit operating areas shall be kept free of weeds, trash, or other unnecessary combustible materials.

(f) *Bulk plants*—(1) *Storage*—(i) *Class I liquids.* Class I liquids shall be stored in closed containers, or in storage tanks above ground outside of buildings, or underground in accordance with paragraph (b) of this section.

(ii) *Class II and III liquids.* Class II and Class III liquids shall be stored in containers, or in tanks within buildings or above ground outside of buildings, or underground in accordance with paragraph (b) of this section.

(iii) *Piling containers.* Containers of flammable or combustible liquids when piled one upon the other shall be separated by dunnage sufficient to provide stability and to prevent excessive stress on container walls. The height of the pile shall be consistent with the stability and strength of containers.

(2) *Buildings*—(i) *Exits.* Rooms in which flammable or combustible liquids are stored or handled by pumps shall have exit facilities arranged to prevent occupants from being trapped in the event of fire.

(ii) *Heating.* Rooms in which Class I liquids are stored or handled shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

(iii) *Ventilation.* (*a*) Ventilation shall be provided for all rooms, buildings, or enclosures in which Class I liquids are pumped or dispensed. Design of ventilation systems shall take into account the relatively high specific gravity of the vapors. Ventilation may be provided by adequate openings in outside walls at floor level unobstructed except by louvers or coarse screens. Where natural ventilation is inadequate, mechanical ventilation shall be provided.

(*b*) Class I liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

(*c*) Containers of Class I liquids shall not be drawn from or filled within buildings unless provision is made to prevent the accumulation of flammable vapors in hazardous concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable liquids are being handled.

(3) *Loading and unloading facilities*—(i) *Separation.* Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings or nearest line of adjoining property that may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill spout. Buildings for pumps or shelters for personnel may be a part of the facility.

(ii) *Class restriction.* Equipment such as piping, pumps, and meters used for the transfer of Class I liquids between storage tanks and the fill stem of the loading rack shall not be used for the transfer of Class II or Class III liquids.

(iii) *Valves.* Valves used for the final control for filling tank vehicles shall be of the self-closing type and manually held open except where automatic means are provided for shutting off the flow when the vehicle is full or after filling of a preset amount.

(iv) *Static protection.* (*a*) Bonding facilities for protection against static sparks during the loading of tank vehicles through open domes shall be provided:

(*1*) Where Class I liquids are loaded, or

(*2*) Where Class II or Class III liquids are loaded into vehicles which may contain vapors from previous cargoes of Class I liquids.

(*b*) Protection as required in (*a*) of this subdivision (iv) shall consist of a metallic bond wire permanently electrically connected to the fill stem or to some part of the rack structure in electrical contact with the fill stem. The free end of such wire shall be provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle.

(*c*) Such bonding connection shall be made fast to the vehicle or tank before dome covers are raised and shall remain in place until filling is completed and all dome covers have been closed and secured.

(*d*) Bonding as specified in (*a*), (*b*), and (*c*) of this subdivision is not required:

(*1*) Where vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalt, most crude oils, residual oils, and water soluble liquids;

(*2*) Where no Class I liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for Class II and Class III liquids; and

(*3*) Where vehicles are loaded or unloaded through closed bottom or top connections.

(*e*) Filling through open domes into the tanks of tank vehicles or tank cars, that contain vapor-air mixtures within the flammable range or where the liquid being filled can form such a mixture, shall be by means of a downspout which extends near the bottom of the tank. This precaution is not required when loading liquids which are nonaccumulators of static charges.

(v) *Stray currents.* Tank car loading facilities where Class I liquids are loaded through open domes shall be protected against stray currents by bonding the pipe to at least one rail and to the rack structure if of metal. Multiple lines entering the rack area shall be electrically bonded together. In addition, in areas where excessive stray currents are known to exist, all pipe entering the rack area shall be provided with insulating sections to electrically isolate the rack piping from the pipelines. No bonding between the tank car and the rack or piping is required during either loading or unloading of Class II or III liquids.

(vi) *Container filling facilities.* Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.

(4) *Wharves*—(i) *Definition, application.* The term wharf shall mean any wharf, pier, bulkhead, or other structure over or contiguous to navigable water used in conjunction with a bulk plant, the primary function of which is the transfer of flammable or combustible liquid cargo in bulk between the bulk plant and any tank vessel, ship, barge, lighter boat, or other mobile floating craft; and this subparagraph shall apply to all such installations except Marine Service Stations as covered in paragraph (g) of this section.

(ii) *Package cargo.* Package cargo of flammable and combustible liquids, including full and empty drums, bulk fuel, and stores may be handled over a wharf and at such times and places as may be agreed upon by the wharf superintendent and the senior deck officer on duty.

(iii) *Location.* Wharves at which flammable or combustible liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be at least 100 feet from any bridge over a navigable waterway, or from an entrance to or superstructure of any vehicular or railroad tunnel under a waterway. The termination of the wharf loading or unloading fixed piping shall be at least 200 feet from a bridge or from an entrance to or superstructure of a tunnel.

(iv) *Design and construction.* Substructure and deck shall be substantially designed for the use intended. Deck may employ any material which will afford the desired combination of flexibility, resistance to shock, durability, strength, and fire resistance. Heavy timber construction is acceptable.

(v) *Tanks.* Tanks used exclusively for ballast water or Class II or Class III liquids may be installed on suitably designed wharves.

(vi) *Pumps.* Loading pumps capable of building up pressures in excess of the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves, or other arrangement to protect the loading facilities against excessive pressure. Relief devices shall be tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set.

(vii) *Hoses and couplings.* All pressure hoses and couplings shall be inspected at intervals appropriate to the service. The hose and couplings shall be tested with the hose extended and using the "inservice maximum operating pressures." Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be withdrawn from service and repaired or discarded.

(viii) *Piping and fittings.* Piping, valves, and fittings shall be in accordance with paragraph (c) of this section, with the following exceptions and additions:

(*a*) Flexibility of piping shall be assured by appropriate layout and arrangement of piping supports so that motion of the wharf structure resulting from wave action, currents, tides, or the mooring of vessels will not subject the pipe to repeated strain beyond the elastic limit.

(*b*) Pipe joints depending upon the friction characteristics of combustible materials or grooving of pipe ends for mechanical continuity of piping shall not be used.

(*c*) Swivel joints may be used in piping to which hoses are connected, and for articulated swivel-joint transfer systems, provided that the design is such that the mechanical strength of the joint will not be impaired if the packing material should fail, as by exposure to fire.

(*d*) Piping systems shall contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage.

(*e*) In addition to the requirements of subdivision (*d*) of this subdivision, each line conveying flammable liquids leading to a wharf shall be provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area. Where more than one line is involved, the valves shall be grouped in one location.

(*f*) Means of easy access shall be provided for cargo line valves located below the wharf deck.

(*g*) Pipelines on flammable or combustible liquids wharves shall be adequately bonded and grounded. If excessive stray currents are encountered, insulating joints shall be installed. Bonding and grounding connections on all pipelines shall be located on wharfside of hose-riser insulating flanges, if used, and shall be accessible for inspection.

(*h*) Hose or articulated swivel-joint pipe connections used for cargo transfer shall be capable of accommodating the combined effects of change in draft and maximum tidal range, and mooring lines shall be kept adjusted to prevent the surge of the vessel from placing stress on the cargo transfer system.

(*i*) Hose shall be supported so as to avoid kinking and damage from chafing.

(ix) *Fire protection.* Suitable portable fire extinguishers with a rating of not less than 12-BC shall be located within 75 feet of those portions of the facility where fires are likely to occur, such as hose connections, pumps, and separator tanks.

(*a*) Where piped water is available, ready-connected fire hose in size appropriate for the water supply shall be provided so that manifolds where connections are made and broken can be reached by at least one hose stream.

(*b*) Material shall not be placed on wharves in such a manner as to obstruct access to firefighting equipment, or important pipeline control valves.

(*c*) Where the wharf is accessible to vehicle traffic, an unobstructed roadway to the shore end of the wharf shall be maintained for access of firefighting apparatus.

(x) *Operations control.* Loading or discharging shall not commence until the wharf superintendent and officer in charge of the tank vessel agree that the tank vessel is properly moored and all connections are properly made. Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization based on a review of the area involved, methods to be employed, and precautions necessary.

(5) *Electrical equipment*—(i) *Application.* This subparagraph shall apply to areas where Class I liquids are stored or handled. For areas where Class II or Class III liquids only are stored or handled, the electrical equipment may be installed in accordance with the provisions of subpart S of this part, for ordinary locations.

(ii) *Conformance.* All electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with subpart S of this part.

(iii) *Classification.* So far as it applies Table H-18 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. In Table H-18 a classified area shall not extend beyond an unpierced wall, roof, or other solid partition. The area classifications listed shall be based on the premise that the installation meets the applicable requirements of this section in all respects.

(6) *Sources of ignition.* Class I liquids shall not be handled, drawn, or dispensed where flammable vapors may reach a source of ignition. Smoking shall be prohibited except in designated localities. "No Smoking" signs shall be conspicuously posted where hazard from flammable liquid vapors is normally present.

(7) *Drainage and waste disposal.* Provision shall be made to prevent flammable or combustible liquids which may be spilled at loading or unloading points from entering public sewers and drainage systems, or natural waterways. Connection to such sewers, drains, or waterways by which flammable or combustible liquids might enter shall be provided with separator boxes or other approved means whereby such entry is precluded. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers, but shall be stored in tanks or tight drums outside of any building until removed from the premises.

(8) *Fire control.* Suitable fire-control devices, such as small hose or portable fire extinguishers, shall be available to locations where fires are likely to occur. Additional fire-control equipment may be required where a tank of more than 50,000 gallons individual capacity contains Class I liquids and where an unusual exposure hazard exists from surrounding property. Such additional fire-control equipment shall be sufficient to extinguish a fire in the largest tank. The design and amount of such equipment shall be in accordance with approved engineering standards.

(g) *Service stations*—(1) *Storage and handling*—(i) *General provisions.* (*a*) Liquids shall be stored in approved closed containers not exceeding 60 gallons capacity, in tanks located underground, in tanks in special enclosures as described in subdivision (ii) of this subparagraph, or in aboveground tanks as provided for in subparagraphs (4)(ii), (*b*), (*c*) and (*d*) of this paragraph.

(*b*) Aboveground tanks, located in an adjoining bulk plant, may be connected by piping to service station underground tanks if, in addition to valves at aboveground tanks, a valve is also installed within control of service station personnel.

(*c*) Apparatus dispensing Class I liquids into the fuel tanks of motor vehicles of the public shall not be located at a bulk plant unless separated by a fence or similar barrier from the area in which bulk operations are conducted.

(*d*) The provisions of (*a*) of this subdivision shall not prohibit the temporary use of movable tanks in conjunction with the dispensing of flammable or combustible liquids into the fuel tanks of motor vehicles or other motorized equipment on premises not normally accessible to the public. Such installations shall only be made under permit from the enforcing authority. The permit shall include a definite time limit.

(*e*) The provisions of (*a*) of this subdivision shall not prohibit the dispensing of flammable liquids in the open from a tank vehicle to a motor vehicle. Such dispensing shall be permitted provided:

(*1*) The tank vehicle complies with the requirements covered in the Standard on Tank Vehicles for Flammable Liquids, NFPA 385-1966.

(*2*) The dispensing is done on premises not open to the public.

(*3*) The motor vehicles are owned or operated by a commercial, industrial, or governmental agency.

(*4*) The dispensing hose does not exceed 50 feet in length.

TABLE H-18—ELECTRICAL EQUIPMENT HAZARDOUS AREAS—BULK PLANTS

Location	NEC Class I Group D division	Extent of classified area
Tank vehicle and tank car:[1]		
Loading through open dome	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 5 feet from edge of dome, extending in all directions.
Loading through bottom connections with atmospheric venting.	1	Within 3 feet of point of venting to atmosphere extending in all directions.
	2	Area between 3 feet and 5 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.
Loading through closed dome with atmospheric venting.	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through closed dome with vapor recovery.	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom loading with vapor recovery or any bottom unloading.	2	Within 3 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Drum and container filling:		
Outdoors, or indoors with adequate ventilation.	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Outdoors, or indoors with adequate ventilation.	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Tank—Aboveground:		
Shell, ends, or roof and dike area	2	Within 10 feet from shell, ends, or roof of tank, Area inside dikes to level of top of dike.
Vent	1	Within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Floating roof	1	Area above the roof and within the shell.
Pits:		
Without mechanical ventilation	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
With mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
Containing valves, fittings or piping, and not within a division 1 or 2 classified area.	2	Entire pit.
Pumps, bleeders, withdrawal fittings, meters and similar devices:		
Indoors	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices.
Outdoors	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of such devices.
Storage and repair garage for tank vehicles	1	All pits or spaces below floor level.
	2	Area up to 18 inches above floor or grade level for entire storage or repair garage.
Drainage ditches, separators, impounding basins.	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontally from any edge.
Garages for other than tank vehicles	Ordinary	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	Ordinary	
Indoor warehousing where there is no flammable liquid transfer.	Ordinary	If there is any opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and rest rooms	Ordinary	

(5) The dispensing nozzle is a listed automatic-closing type without a latch-open device.

(*f*) Class I liquids shall not be stored or handled within a building having a basement or pit into which flammable vapors may travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

(*g*) Accurate inventory records shall be maintained and reconciled on all Class I liquid storage tanks for possible indication of leakage from tanks or piping.

(ii) *Special enclosures*. (*a*) When installation of tanks in accordance with paragraph (b)(3) of this section is impractical because of property or building limitations, tanks for flammable or combustible liquids may be installed in buildings if properly enclosed.

(*b*) The enclosure shall be substantially liquid and vaportight without backfill. Sides, top, and bottom of the enclosure shall be of reinforced concrete at least 6 inches thick, with openings for inspection through the top only. Tank connections shall be so piped or closed that neither vapors nor liquid can escape into the enclosed space. Means shall be provided whereby portable equipment may be employed to discharge to the outside any liquid or vapors which might accumulate should leakage occur.

(*c*) At automotive service stations provided in connection with tenant or customer parking facilities at or below grade level in large buildings of commercial, mercantile, or residential occupancy, tanks containing Class I liquids, installed of necessity in accordance with (*b*) of this subdivision, shall not exceed 6,000 gallons individual or 18,000 gallons aggregate capacity.

(iii) *Inside buildings*. (*a*) Except where stored in tanks as provided in subdivision (ii) of this subparagraph, no Class I liquids shall be stored within any service station building except in closed containers of aggregate capacity not exceeding 60 gallons. One container not exceeding 60 gallons capacity equipped with an approved pump is permitted.

(*b*) Class I liquids may be transferred from one container to another in lubrication or service rooms of a service station building provided the electrical installation complies with Table H-19 and provided that any heating equipment complies with subparagraph (6) of this paragraph.

(*c*) Class II and Class III liquids may be stored and dispensed inside service station buildings from tanks of not more than 120 gallons capacity each.

(iv) *Labeling*. No sale or purchase of any Class I, II, or III liquids shall be made in containers unless such containers are clearly marked with the name of the product contained therein.

(v) *Dispensing into portable containers*. No delivery of any Class I liquids shall be made into portable containers unless the container is constructed of metal, has a tight closure with screwed or spring cover, and is fitted with a spout or so designed that the contents can be poured without spilling.

(2) *Private stations*. Service stations not accessible to or open to the public do not require an attendant or supervisor. Such stations may be used by commercial, industrial, governmental, or manufacturing establishments.

(3) *Dispensing systems*—(i) *Location*. Dispensing devices at automotive service stations shall be so located that all parts of the vehicle being served will be on the premises of the service station.

(ii) *Inside location*. Approved dispensing units may be located inside of buildings. The dispensing area shall be separated from other areas in an approved manner. The dispensing unit and its piping shall be mounted either on a concrete island or protected against collision damage by suitable means and shall be located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control. The dispensing area shall be provided with an approved mechanical or gravity ventilation system. When dispensing units are located below grade, only approved mechanical ventilation shall be used and the entire dispensing area shall be protected by an approved automatic sprinkler system. Ventilating systems shall be electrically interlocked with gasoline dispensing units so that the dispensing units cannot be operated unless the ventilating fan motors are energized.

(iii) *Emergency power cutoff*. A clearly identified and easily accessible switch(es) or a circuit breaker(s) shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency.

(iv) *Dispensing units*. (a) Class I liquids shall be transferred from tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge.

---

[1] When classifying the extent of the area, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

(*b*) Dispensing devices for Class I liquids shall be of approved type.

(*c*) Class I liquids shall not be dispensed by pressure from drums, barrels, and similar containers. Approved pumps taking suction through the top of the container or approved self-closing faucets shall be used.

(*d*) The dispensing units, except those attached to containers, shall be mounted either on a concrete island or protected against collision damage by suitable means.

(v) *Remote Pumping systems.*

(*a*) This subdivision shall apply to systems for dispensing Class I liquids where such liquids are transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units.

(*b*) Pumps shall be designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure. Pumps installed above grade, outside of buildings, shall be located not less than 10 feet from lines of adjoining property which may be built upon, and not less than 5 feet from any building opening. When an outside pump location is impractical, pumps may be installed inside of buildings, as provided for dispensers in subdivision (ii) of this subparagraph, or in pits as provided in subdivision (c) of this subdivision. Pumps shall be substantially anchored and protected against physical damage by vehicles.

(*c*) Pits for subsurface pumps or piping manifolds of submersible pumps shall withstand the external forces to which they may be subjected without damage to the pump, tank, or piping. The pit shall be no larger than necessary for inspection and maintenance and shall be provided with a fitted cover.

(*d*) A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket on the dispensing unit and the switch on this dispensing unit is manually actuated. This control shall also stop the pump when all nozzles have been returned to their brackets.

(*e*) An approved impact valve, incorporating a fusible link, designed to close automatically in the event of severe impact or fire exposure shall be properly installed in the dispensing supply line at the base of each individual dispensing device.

(*f*) Testing. After the completion of the installation, including any paving, that section of the pressure piping system between the pump discharge and the connection for the dispensing facility shall be tested for at least 30 minutes at the maximum operating pressure of the system. Such tests shall be repeated at 5-year intervals thereafter.

(vi) *Delivery nozzles.* (*a*) Hose-nozzle valves of either the manual or automatic-closing type for dispensing Class I liquids into a fuel tank or into a container shall be manually held open during the dispensing operation except as provided in subdivision (b) of this subdivision.

(*b*) On any service station dispenser accessible to the public a listed automatic type nozzle with hold-open latch is permitted only when all dispensing of Class I liquids is to be done by the service station attendant.

(*c*) If the dispensing of Class I liquids at a service station available and open to the public is to be done by a person other than the service station attendant, the nozzle shall be a listed automatic-closing type without a hold-open latch.

(vii) *Special type dispensers.* (*a*) Special dispensing devices such as, but not limited to, coin-operated, and remote preset types are permitted at service stations, provided there is at least one qualified attendant on duty while the station is open to the public.

(*b*) Emergency controls shall be installed at an acceptable location, but controls shall not be more than 100 feet from dispensers.

(*c*) Instructions for the operation of dispensers shall be conspicuously posted.

(4) *Marine service stations*—(i) *Dispensing.* (*a*) The dispensing area shall be located away from other structures so as to provide room for safe ingress and egress of craft to be fueled. Dispensing units shall in all cases be at least 20 feet from any activity involving fixed sources of ignition.

(*b*) Dispensing shall be by approved dispensing units with or without integral pumps and may be located on open piers, wharves, or floating docks or on shore or on piers of the solid fill type.

(*c*) Dispensing nozzles shall be automatic-closing without a hold-open latch.

(ii) *Tanks and pumps.* (*a*) Tanks, and pumps not integral with the dispensing unit, shall be on shore or on a pier of the solid fill type, except as provided in subdivisions (*b*) and (*c*) of this subdivision.

(*b*) Where shore location would require excessively long supply lines to dispensers, tanks may be installed on a pier provided that applicable portions of paragraph (b) of this section relative to spacing, diking, and piping are complied with and the quantity so stored does not exceed 1,100 gallons aggregate capacity.

(*c*) Shore tanks supplying marine service stations may be located above ground, where rock ledges or high water table make underground tanks impractical.

(*d*) Where tanks are at an elevation which would produce gravity head on the dispensing unit, the tank outlet shall be equipped with a pressure control valve positioned adjacent to and outside the tank block valve specified in paragraph (b) (2) (ix) (*b*) of this section, so adjusted that liquid cannot flow by gravity from the tank in case of piping or hose failure.

(iii) *Piping.* (*a*) Piping between shore tanks and dispensing units shall be as described in paragraph (c) of this section, except that, where dispensing is from a floating structure, suitable lengths of oil-resistant flexible hose may be employed between the shore piping and the piping on the floating structure as made necessary by change in water level or shoreline.

(*b*) A readily accessible valve to shut off the supply from shore shall be provided in each pipeline at or near the approach to the pier and at the shore end of each pipeline adjacent to the point where flexible hose is attached.

(*c*) Piping shall be located so as to be protected from physical damage.

(*d*) Piping handling Class I liquids shall be grounded to control stray currents.

(5) *Electrical equipment*—(i) *Application.* This subparagraph shall apply to areas where Class I liquids are stored or

TABLE H-19—ELECTRICAL EQUIPMENT HAZARDOUS AREAS—SERVICE STATIONS

Location	NEC Class I Group D division	Extent of classified area
Underground tank:		
Fill opening	1 2	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area. Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose fill connection and within a horizontal radius of 5 feet from a tight fill connection.
Vent—Discharging upward	1 2	Within 3 feet of open end of vent, extending in all directions. Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Dispenser:		
Pits	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
Dispenser enclosure	1	The area 4 feet vertically above base within the enclosure and 18 inches horizontally in all directions.
Outdoor	2	Up to 18 inches above grade level within 20 feet horizontally of any edge of enclosure.
Indoor:		
With mechanical ventilation	2	Up to 18 inches above grade or floor level within 20 feet horizontally of any edge of enclosure.
With gravity ventilation	2	Up to 18 inches above grade or floor level within 25 feet horizontally of any edge of enclosure.
Remote pump—Outdoor	1 2	Any pit, box or space below grade level if any part is within a horizontal distance of 10 feet from any edge of pump. Within 3 feet of any edge of pump, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of pump.
Remote pump—Indoor	1 2	Entire area within any pit. Within 5 feet of any edge of pump, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of pump.
Lubrication or service room	1 2	Entire area within any pit. Area up to 18 inches above floor or grade level within entire lubrication room.
Dispenser for Class I Liquids	2	Within 3 feet of any fill or dispensin point, extending in all directions.
Special enclosure inside building per § 1910.-106 (f) (1) (ii).	1	Entire enclosure.
Sales, storage and rest rooms	Ordinary	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

handled. For areas where Class II or Class III liquids are stored or handled the electrical equipment may be installed in accordance with the provisions of Subpart S of this part, for ordinary locations.

(ii) All electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with Subpart S of this part.

(iii) So far as it applies, Table H–19 shall be used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances. A classified area shall not extend beyond an unpierced wall, roof, or other solid partition.

(iv) The area classifications listed shall be based on the assumption that the installation meets the applicable requirements of this section in all respects.

(6) *Heating equipment*—(i) *Conformance.* Heating equipment shall be installed as provided in subdivisions (ii) through (v) of this subparagraph.

(ii) *Application.* Heating equipment may be installed in the conventional manner in an area except as provided in subdivisions (iii), (iv), or (v) of this subparagraph.

(iii) *Special room.* Heating equipment may be installed in a special room separated from an area classified by Table H–19 by walls having a fire resistance rating of at least 1 hour and without any openings in the walls within 8 feet of the floor into an area classified in Table H–19. This room shall not be used for combustible storage and all air for combustion purposes shall come from outside the building.

(iv) *Work areas.* Heating equipment using gas or oil fuel may be installed in the lubrication, sales, or service room where there is no dispensing or transferring of Class I liquids provided the bottom of the combustion chamber is at least 18 inches above the floor and the heating equipment is protected from physical damage by vehicles. Heating equipment using gas or oil fuel listed for use in garages may be installed in the lubrication or service room where Class I liquids are dispensed provided the equipment is installed at least 8 feet above the floor.

(v) *Electric heat.* Electrical heating equipment shall conform to subparagraph (5) of this paragraph.

(7) *Drainage and waste disposal.* Provision shall be made in the area where Class I liquids are dispensed to prevent spilled liquids from flowing into the interior of service station buildings. Such provision may be by grading driveways, raising door sills, or other equally effective means. Crankcase drainings and flammable or combustible liquids shall not be dumped into sewers but shall be stored in tanks or drums outside of any building until removed from the premises.

(8) *Sources of ignition.* In addition to the previous restrictions of this paragraph, the following shall apply: There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids. Conspicuous and legible signs prohibiting smoking shall be posted within sight of the customer being served. The motors of all equipment being fueled shall be shut off during the fueling operation.

(9) *Fire control.* Each service station shall be provided with at least one fire extinguisher having a minimum approved classification of 6 B, C located so that an extinguisher will be within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service room.

(h) *Processing plants*—(1) *Scope.* This paragraph shall apply to those plants or buildings which contain chemical operations such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes but shall not apply to chemical plants, refineries or distilleries.

(2) *Location*—(i) *Classification.* The location of each processing vessel shall be based upon its flammable or combustible liquid capacity. Processing vessels shall be located, with respect to distances to lines of adjoining property which may be built upon, in accordance with Table H–20, except when the processing plant is designed in accordance with subdivision (ii) of this subparagraph.

TABLE H–20

Processing vessels with emergency relief venting to permit pressure	Stable liquids	Unstable liquids
Not in excess of 2.5 p.s.i.g.	Table H–9	2½ times Table H–9
Over 2.5 p.s.i.g.	1½ times Table H–9	4 times Table H–9

(ii) *Exception.* The distances required in subdivision (i) of this subparagraph may be waived when the vessels are housed within a building and the exterior wall facing the line of adjoining property which may be built upon is a blank wall having a fire-resistance rating of not less than 4 hours. When Class IA or unstable liquids are handled, the blank wall shall have explosion resistance in accordance with good engineering practice, see subparagraph (3)(iv) of this paragraph.

(3) *Processing building*—(i) *Construction.* (*a*) Processing buildings shall be of fire-resistance or noncombustible construction, except heavy timber construction with load-bearing walls may be permitted for plants utilizing only stable Class II or Class III liquids. Except as provided in subparagraph (2)(ii) of this paragraph or in the case of explosion resistant walls used in conjunction with explosion relieving facilities, see subparagraph (3)(iv) of this paragraph, load-bearing walls are prohibited. Buildings shall be without basements or covered pits.

(*b*) Areas shall have adequate exit facilities arranged to prevent occupants from being trapped in the event of fire. Exits shall not be exposed by the drainage facilities described in subdivision (ii) of this subparagraph.

(ii) *Drainage.* (*a*) Emergency drainage systems shall be provided to direct flammable or combustible liquid leakage and fire protection water to a safe location. This may require curbs, scuppers, or special drainage systems to control the spread of fire, see paragraph (b)(2)(vii)(*b*) of this section.

(*b*) Emergency drainage systems, if connected to public sewers or discharged into public waterways, shall be equipped with traps or separators.

(*c*) The processing plant shall be designed and operated to prevent the normal discharge of flammable or combustible liquids to public waterways, public sewers, or adjoining property.

(iii) *Ventilation.* (*a*) Enclosed processing buildings shall be ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area. This shall be accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building. Provision shall be made for introduction of makeup air in such a manner as not to short circuit the ventilation. Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.

(*b*) Equipment used in a building and the ventilation of the building shall be designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment, and to not more than 5 feet from equipment which exposes Class I liquids to the air. Examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.

(iv) *Explosion relief.* Areas where Class IA or unstable liquids are processed shall have explosion venting through one or more of the following methods:

(*a*) Open air construction.

(*b*) Lightweight walls and roof.

(*c*) Lightweight wall panels and roof hatches.

(*d*) Windows of explosion venting type.

(4) *Liquid handling*—(i) *Storage.* (*a*) The storage of flammable or combustible liquids in tanks shall be in accordance with the applicable provisions of paragraph (b) of this section.

(*b*) If the storage of flammable or combustible liquids in outside aboveground or underground tanks is not practical because of temperature or production considerations, tanks may be permitted inside of buildings or structures in accordance with the applicable provisions of paragraph (b) of this section.

(*c*) Storage tanks inside of buildings shall be permitted only in areas at or above grade which have adequate drainage and are separated from the processing area by construction having a fire resistance rating of at least 2 hours.

(*d*) The storage of flammable or combustible liquids in containers shall be in accordance with the applicable provisions of paragraph (d) of this section.

(ii) *Piping, valves, and fittings.* (*a*) Piping, valves, and fittings shall be in accordance with paragraph (c) of this section.

(*b*) Approved flexible connectors may be used where vibration exists or where frequent movement is necessary. Approved hose may be used at transfer stations.

(*c*) Piping containing flammable or combustible liquids shall be identified.

(iii) *Transfer.* (*a*) The transfer of large quantities of flammable or combustible liquids shall be through piping by means of pumps or water displacement. Except as required in process equipment, gravity flow shall not be used. The use of compressed air as a transferring medium is prohibited.

(*b*) Positive displacement pumps shall be provided with pressure relief discharging back to the tank or to pump suction.

(iv) *Equipment.* (*a*) Equipment shall be designed and arranged to prevent the unintentional escape of liquids and vapors and to minimize the quantity escaping in the event of accidental release.

(*b*) Where the vapor space of equipment is usually within the flammable range, the probability of explosion damage to the equipment can be limited by inerting, by providing an explosion suppression system, or by designing the equipment to contain the peak explosion pressure which may be modified by explosion relief. Where the special hazards of operation, sources of ignition, or exposures indicate a need, consideration shall be given to providing protection by one or more of the above means.

(5) *Tank vehicle and tank car loading and unloading.* Tank vehicle and tank car loading or unloading facilities shall be separated from aboveground tanks, warehouses, other plant buildings, or nearest line of adjoining property which may be built upon by a distance of 25 feet for Class I liquids and 15 feet for Class II and Class III liquids measured from the nearest position of any fill stem. Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of paragraph (f)(3) of this section.

(6) *Fire control*—(i) *Portable extinguishers.* Approved portable fire extinguishers of appropriate size, type, and number shall be provided.

(ii) *Other controls.* Where the special hazards of operation or exposure indicate a need, the following fire control provision shall be provided.

(*a*) A reliable water supply shall be available in pressure and quantity adequate to meet the probable fire demands.

(*b*) Hydrants shall be provided in accordance with accepted good practice.

(*c*) Hose connected to a source of water shall be installed so that all vessels, pumps, and other equipment containing flammable or combustible liquids can be reached with at least one hose stream. Nozzles that are capable of discharging a water spray shall be provided.

(*d*) Processing plants shall be protected by an approved automatic sprinkler system or equivalent extinguishing system. If special extinguishing systems including but not limited to those employing foam, carbon dioxide, or dry chemical are provided, approved equipment shall be used and installed in an approved manner.

(iii) *Alarm systems.* An approved means for prompt notification of fire to those within the plant and any public fire department available shall be provided. It may be advisable to connect the plant system with the public system where public fire alarm system is available.

(iv) *Maintenance.* All plant fire protection facilities shall be adequately maintained and periodically inspected and tested to make sure they are always in satisfactory operating condition and that they will serve their purpose in time of emergency.

(7) *Sources of ignition*—(i) *General.* (*a*) Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

(*b*) Class I liquids shall not be dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.

(ii) *Maintenance and repair.* (*a*) When necessary to do maintenance work in a flammable or combustible liquid processing area, the work shall be authorized by a responsible representative of the employer.

(*b*) Hot work, such as welding or cutting operations, use of spark-producing power tools, and chipping operations shall be permitted only under supervision of an individual in responsible charge who shall make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified.

(iii) *Electrical.* (*a*) All electrical wiring and equipment within storage or processing areas shall be installed in accordance with nationally recognized good practice.

(*b*) Locations where flammable vapor-air mixtures may exist under normal operations shall be classified Class I, Division 1 according to the requirements of Subpart S of this part. For those pieces of equipment installed in accordance with subparagraph (3)(iii)(*b*) of this paragraph, the Division 1 area shall extend 5 feet in all directions from all points of vapor liberation. All areas within pits shall be classified Division 1 if any part of the pit is within a Division 1 or 2 classified area, unless the pit is provided with mechanical ventilation.

(*c*) Locations where flammable vapor-air mixtures may exist under abnormal conditions and for a distance beyond Division 1 locations shall be classified Division 2 according to the requirements of Subpart S of this Part. These locations include an area within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling Class I liquids. Pits provided with adequate mechanical ventilation within a Division 1 or 2 area shall be classified Division 2. If Class II or Class III liquids only are handled, then ordinary electrical equipment is satisfactory though care shall be used in locating electrical apparatus to prevent hot metal from falling into open equipment.

(*d*) Where the provisions of (*a*), (*b*), and (*c*), of this subdivision (iii) require the installation of explosion-proof equipment, ordinary electrical equipment including switchgear may be used if installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area. Ventilation makeup air shall be uncontaminated by flammable vapors.

(8) *Housekeeping*—(i) *General.* Maintenance and operating practices shall be in accordance with established procedures which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids. Spills shall be cleaned up promptly.

(ii) *Access.* Adequate aisles shall be maintained for unobstructed movement of personnel and so that fire protection equipment can be brought to bear on any part of the processing equipment.

(iii) *Waste and residues.* Combustible waste material and residues in a building or operating area shall be kept to a minimum, stored in closed metal waste cans, and disposed of daily.

(iv) *Clear zone.* Ground area around buildings and operating areas shall be kept free of tall grass, weeds, trash, or other combustible materials.

(i) *Refineries, chemical plants, and distilleries*—(1) *Storage tanks.* Flammable or combustile liquids shall be stored in tanks, in containers, or in portable tanks. Tanks shall be installed in accordance with paragraph (b) of this section. Tanks for the storage of flammable or combustile liquids in tank farms and in locations other than process areas shall be located in accordance with paragraph (b)(2) (i) and (ii) of this section.

(2) *Wharves.* Wharves handling flammable or combustible liquids shall be in accordance with paragraph (f)(4) of this section.

(3) *Fired and unfired pressure vessels*—(i) *Fired vessels.* Fired pressure vessels shall be constructed in accordance with the Code for Fired Pressure Vessels, Section I of the ASME Boiler and Pressure Vessel Code—1968.

(ii) Unfired vessels shall be constructed in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code—1968.

(4) *Location of process units.* Process units shall be located so that they are accessible from at least one side for the

purpose of fire control. Where topographical conditions are such that flammable or combustible liquids may flow from a processing area so as to constitute a fire hazard to property of others, provision shall be made to divert or impound the flow by curbs, drains, or other suitable means.

(5) *Fire control*—(i) *Portable equipment.* Portable fire extinguishment and control equipment shall be provided in such quantities and types as are needed for the special hazards of operation and storage.

(ii) *Water supply.* Water shall be available in volume and at adequate pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems as the need is indicated by the special hazards of operation and storage.

(iii) *Special equipment.* Special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical shall be provided as the need is indicated by the special hazards of operation and storage.

(j) *Scope.* This section applies to the handling, storage, and use of flammable and combustible liquids with a flash point below 200° F. This section does not apply to:

(1) Bulk transportation of flammable and combustible liquids;

(2) Storage, handling, and use of fuel oil tanks and containers connected with oil burning equipment;

(3) Storage of flammable and combustible liquids on farms;

(4) Liquids without flashpoints that may be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons;

(5) Mists, sprays, or foams, except flammable aerosols covered in paragraph (d) of this section; or

(6) Installations made in accordance with requirements of the following standards:

(i) National Fire Protection Association Standard for Drycleaning Plants, NFPA No. 32–1970;

(ii) National Fire Protection Association Standard for the Manufacture of Organic Coatings, NFPA No. 35–1970;

(iii) National Fire Protection Association Standard for Solvent Extraction Plants, NFPA No. 36–1967; or

(iv) National Fire Protection Association Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA No. 37–1970.

§ 1910.107 Spray finishing using flammable and combustible materials.

(a) *Definitions applicable to this section*—(1) *Aerated solid powders.* Aerated powders shall mean any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations.

(2) *Spraying area.* Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.

(3) *Spray booth.* A power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system.

(4) *Waterwash spray booth.* A spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.

(5) *Dry spray booth.* A spray booth not equipped with a water washing system as described in subparagraph (3) of this paragraph. A dry spray booth may be equipped with (i) distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct; or (ii) overspray dry filters to minimize dusts; or (iii) overspray dry filters to minimize dusts or residues entering exhaust ducts; or (iv) overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or (v) where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.

(6) *Fluidized bed.* A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.

(7) *Electrostatic fluidized bed.* A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported through the container immediately above the charged and aerated materials in order to be coated.

(8) *Approved.* Shall mean approved and listed by the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factory Mutual Engineering Corp.

(9) *Listed.* See "approved" in § 1910.107 (a)(8).

(b) *Spray booths*—(1) *Construction.* Spray booths shall be substantially constructed of steel not thinner than No. 18 U.S. gauge, securely and rigidly supported, or of concrete or masonry, except that aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying. Spray booths shall be designed to sweep air currents toward the exhaust outlet.

(2) *Interiors.* The interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.

(3) *Floors.* The floor surface of a spray booth and operator's working area, if combustible, shall be covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.

(4) *Distribution or baffle plates.* Distribution or baffle plates, if installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct, shall be of noncombustible material and readily removable or accessible on both sides for cleaning. Such plates shall not be located in exhaust ducts.

(5) *Dry type overspray collectors*—(*exhaust air filters*). In conventional dry type spray booths, overspray dry filters or filter rolls, if installed, shall conform to the following:

(i) The spraying operations except electrostatic spraying operations shall be so designed, installed and maintained that the average air velocity over the open face of the booth (or booth cross section during spraying operations) shall be not less than 100 linear feet per minute. Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear feet per minute, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics. Visible gauges or audible alarm or pressure activated devices shall be installed to indicate or insure that the required air velocity is maintained. Dry spray booths equipped with a filter roll which is automatically advanced when the air velocity is reduced to that specified in this subdivision should be arranged to cause shutdown of spraying operations if the filter roll fails to advance automatically. Maintenance procedures should be established to assure replacing filter pads before excessive restriction to airflow occurs. Filter pads should be inspected after each period of use and clogged filter pads discarded and replaced. Filter rolls shall be inspected to insure proper replacement of filter media.

(ii) All discarded filter pads and filter rolls shall be immediately removed to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely in water.

(iii) The location of filters in a spray booth shall be so as to not reduce the effective booth enclosure of the articles being sprayed.

(iv) Space within the spray booth on the downstream and upstream sides of filters shall be protected with approved automatic sprinklers.

(v) Filters or filter rolls shall not be used when applying a spray material know to be highly susceptible to spontaneous heating and ignition.

(vi) Clean filters or filter rolls shall be noncombustible or of a type having a combustibility not in excess of class 2 filters as listed by Underwriters' Laboratories, Inc. Filters and filter rolls shall not be alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition. See also paragraph (g) (6) of this section.

(6) *Frontal area.* Each spray booth having a frontal area larger than 9 square feet shall have a metal deflector or curtain not less than 2½ inches deep installed at the upper outer edge of the booth over the opening.

(7) *Conveyors.* Where conveyors are arranged to carry work into or out of spray booths, the openings therefor shall be as small as practical.

(8) *Separation of operations.* Each spray booth shall be separated from other operations by not less than 3 feet, or by a greater distance, or by such partition or wall as to reduce the danger from juxtaposition of hazardous operations. See also paragraph (c)(1) of this section.

(9) *Cleaning.* Spray booths shall be so installed that all portions are readily accessible for cleaning. A clear space of not less than 3 feet on all sides shall be kept free from storage or combustible construction.

(10) *Illumination.* When spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units shall be used as a source of illumination. Panels shall effectively isolate the spraying area from the area in which the lighting unit is located, and shall be of a noncombustible material of such a nature or so protected that breakage will be unlikely. Panels shall be so arranged that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.

(c) *Electrical and other sources of ignition*—(1) *Conformance.* All electrical equipment, open flames and other sources of ignition shall conform to the requirements of this paragraph, except as follows:

(i) Electrostatic apparatus shall conform to the requirements of paragraphs (h) and (i) of this section;

(ii) Drying, curing, and fusion apparatus shall conform to the requirements of paragraph (j) of this section;

(iii) Automobile undercoating spray operations in garages shall conform to the requirements of paragraph (k) of this section.

(iv) Powder coating equipment shall conform to the requirements of paragraph (l) of this section.

(2) *Minimum separation.* There shall be no open flame or spark producing equipment in any spraying area nor within 20 feet thereof, unless separated by a partition.

(3) *Hot surfaces.* Space-heating appliances, steampipes, or hot surfaces shall not be located in a spraying area where deposits of combustible residues may readily accumulate.

(4) *Wiring conformance.* Electrical wiring and equipment shall conform to the provisions of this paragraph and shall otherwise be in accordance with subpart S of this part.

(5) *Combustible residues, areas.* Unless specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors, there shall be no electrical equipment in any spraying area, whereon deposits of combustible residues may readily accumulate, except wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.

(6) *Wiring type approved.* Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area as herein defined shall be of explosion-proof type approved for Class I, group D locations and shall otherwise conform to the provisions of subpart S of this part, for Class I, Division 1, Hazardous Locations. Electrical wiring, motors, and other equipment outside of but within twenty (20) feet of any spraying area, and not separated therefrom by partitions, shall not produce sparks under normal operating conditions and shall otherwise conform to the provisions of subpart S of this part for Class I, Division 2 Hazardous Locations.

(7) *Lamps.* Electric lamps outside of, but within twenty (20) feet of any spraying area, and not separated therefrom by a partition, shall be totally enclosed to prevent the falling of hot particles and shall be protected from mechanical injury by suitable guards or by location.

(8) *Portable lamps.* Portable electric lamps shall not be used in any spraying area during spraying operations. Portable electric lamps, if used during cleaning or repairing operations, shall be of the type approved for hazardous Class I locations.

(9) *Grounding.* (i) All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids shall be properly electrically grounded in an effective and permanent manner.

(ii) "Airless" high-fluid pressure spray guns and any conductive object being sprayed should be properly electrically grounded.

(d) *Ventilation*—(1) *Conformance.* Ventilating and exhaust systems shall be in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961, where applicable and shall also conform to the provisions of this section.

(2) *General.* All spraying areas shall be provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life or property is not endangered. Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.

(3) *Independent exhaust.* Each spray booth shall have an independent exhaust duct system discharging to the exterior of the building, except that multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust. If more than one fan serves one booth, all fans shall be so interconnected that one fan cannot operate without all fans being operated.

(4) *Fan-rotating element.* The fan-rotating element shall be nonferrous or nonsparking or the casing shall consist of or be lined with such material. There shall be ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction, necessary allowance being made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded, the shaft preferably to have bearings outside the duct and booth. All bearings shall be of the self-lubricating type, or lubricated from the outside duct.

(5) *Electric motors.* Electric motors driving exhaust fans shall not be placed inside booths or ducts. See also paragraph (c) of this section.

(6) *Belts.* Belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed.

(7) *Exhaust ducts.* Exhaust ducts shall be constructed of steel and shall be substantially supported. Exhaust ducts without dampers are preferred; however, if dampers are installed, they shall be maintained so that they will be in a full open position at all times the ventilating system is in operation.

(i) Exhaust ducts shall be protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 inches.

(ii) If combustible construction is provided with the following protection applied to all surfaces within 18 inches, clearances may be reduced to the distances indicated:

(*a*) 28-gage sheet metal on ¼-inch asbestos mill board.	12 inches.
(b) 28-gage sheet metal on ⅛-inch asbestos mill board spaced out 1 inch on noncombustible spacers.	9 inches.
(*c*) 22-gage sheet metal on 1-inch rockwool batts reinforced with wire mesh or the equivalent.	3 inches.
(*d*) Where ducts are protected with an approved automatic sprinkler system, properly maintained, the clearance required in subdivision (i) of this subparagraph may be reduced to 6 inches.	

(8) *Discharge clearance.* Unless the spray booth exhaust duct terminal is from a water-wash spray booth, the terminal discharge point shall be not less than 6 feet from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet.

(9) *Air exhaust.* Air exhaust from spray operations shall not be directed

so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes, nor directed so as to create a nuisance. Air exhausted from spray operations shall not be recirculated.

(10) *Access doors.* When necessary to facilitate cleaning, exhaust ducts shall be provided with an ample number of access doors.

(11) *Room intakes.* Air intake openings to rooms containing spray finishing operations shall be adequate for the efficient operation of exhaust fans and shall be so located as to minimize the creation of dead air pockets.

(12) *Drying spaces.* Freshly sprayed articles shall be dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors. In the event adequate and reliable ventilation is not provided such drying spaces shall be considered a spraying area. See also paragraph (j) of this section.

(e) *Flammable and combustible liquids—storage and handling*—(1) *Conformance.* The storage of flammable or combustible liquids in connection with spraying operations shall conform to the requirements of **§ 1910.106**, where applicable.

(2) *Quantity.* The quantity of flammable or combustible liquids kept in the vicinity of spraying operations shall be the minimum required for operations and should ordinarily not exceed a supply for 1 day or one shift. Bulk storage of portable containers of flammable or combustible liquids shall be in a separate, constructed building detached from other important buildings or cut off in a standard manner.

(3) *Containers.* Original closed containers, approved portable tanks, approved safety cans or a properly arranged system of piping shall be used for bringing flammable or combustible liquids into spray finishing room. Open or glass containers shall not be used.

(4) *Transferring liquids.* Except as provided in subparagraph (5) of this paragraph the withdrawal of flammable and combustible liquids from containers having a capacity of greater than 60 gallons shall be by approved pumps. The withdrawal of flammable or combustible liquids from containers and the filling of containers, including portable mixing tanks, shall be done only in a suitable mixing room or in a spraying area when the ventilating system is in operation. Adequate precautions shall be taken to protect against liquid spillage and sources of ignition.

(5) *Spraying containers.* Containers supplying spray nozzles shall be of closed type or provided with metal covers kept closed. Containers not resting on floors shall be on metal supports or suspended by wire cables. Containers supplying spray nozzles by gravity flow shall not exceed 10 gallons capacity. Original shipping containers shall not be subject to air pressure for supplying spray nozzles. Containers under air pressure supplying spray nozzles shall be of limited capacity, not exceeding that necessary for 1 day's operation; shall be designed and approved for such use; shall be provided with a visible pressure gage; and shall be provided with a relief valve set to operate in conformance with the requirements of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code—1968. Containers under air pressure supplying spray nozzles, air-storage tanks and coolers shall conform to the standards of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code—1968 for construction, tests, and maintenance.

(6) *Pipes and hoses.* (i) All containers or piping to which is attached a hose or flexible connection shall be provided with a shutoff valve at the connection. Such valves shall be kept shut when spraying operations are not being conducted.

(ii) When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose.

(iii) All pressure hose and couplings shall be inspected at regular intervals appropriate to this service. The hose and couplings shall be tested with the hose extended, and using the "inservice maximum operating pressures." Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings, shall be withdrawn from service and repaired or discarded.

(iv) Piping systems conveying flammable or combustible liquids shall be of steel or other material having comparable properties of resistance to heat and physical damage. Piping systems shall be properly bonded and grounded.

(7) *Spray liquid heaters.* Electrically powered spray liquid heaters shall be approved and listed for the specific location in which used (see paragraph (c) of this section). Heaters shall not be located in spray booths nor other locations subject to the accumulation of deposits or combustible residue. Agitators, if used, should preferably be driven by compressed air, water, or low-pressure steam. If an electric motor is used, see paragraph (c) of this section.

(8) *Pump relief.* If flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, the pump discharge line shall be provided with an approved relief valve discharging to a pump suction or a safe detached location, or a device provided to stop the prime mover if the discharge pressure exceeds the safe operating pressure of the system.

(9) *Grounding.* Whenever flammable or combustible liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to prevent discharge sparks of static electricity.

(f) *Protection*—(1) *Conformance.* In sprinklered buildings, the automatic sprinkler system in rooms containing spray finishing operations shall conform to the Standard for the Installation of Sprinkler Systems, NFPA 13-1969, provisions for Extra Hazard Occupancy, and in unsprinklered buildings where sprinklers are installed only to protect spraying areas, the installation shall conform to such standards insofar as they may be applicable. Sprinkler installations shall also conform to the provisions of this paragraph. Sprinkler heads shall be located to effect water distribution throughout the entire booth.

(2) *Valve access.* Automatic sprinklers protecting each spray booth (together with its connecting exhaust) shall be under an accessibly located separate outside stem and yoke (OS&Y) subcontrol valve.

(3) *Cleaning of heads.* Sprinklers protecting spraying areas shall be kept as free from deposits as practical by cleaning daily if necessary. (See also paragraph (g) of this section.)

(4) *Portable extinguishers.* An adequate supply of suitable portable fire extinguishers shall be installed near all spraying areas.

(g) *Operations and maintenance.*—(1) *Spraying.* Spraying shall not be conducted outside of predetermined spraying areas.

(2) *Cleaning.* All spraying areas shall be kept as free from the accumulation of deposits of combustible residues as practical, with cleaning conducted daily if necessary. Scrapers, spuds, or other such tools used for cleaning purposes shall be of nonsparking material.

(3) *Residue disposal.* Residue scrapings and debris contaminated with residue shall be immediately removed from the premises and properly disposed of. Approved metal waste cans shall be provided wherever rags or waste are impregnated with finishing material and all such rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at least once daily or at the end of each shift.

(4) *Clothing storage.* Spray finishing employees' clothing shall not be left on the premises overnight unless kept in metal lockers.

(5) *Cleaning solvents.* The use of solvents for cleaning operations shall be restricted to those having flashpoints not less than 100° F.; however, for cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations may be used. Such cleaning shall be conducted inside spray booths and ventilating equipment operated during cleaning.

(6) *Hazardous materials combinations.* Spray booths shall not be alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second used material.

(7) *"No Smoking" signs.* "No smoking" signs in large letters on contrasting color background shall be conspicuously posted at all spraying areas and paint storage rooms.

(h) *Fixed electrostatic apparatus*—(1) *Conformance.* Where installation and use of electrostatic spraying equipment is used, such installation and use shall conform to all other paragraphs of this section, and shall also conform to the requirements of this paragraph.

(2) *Type approval.* Electrostatic apparatus and devices used in connection with coating operations shall be of approved types.

(3) *Location.* Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, shall be located outside of the spraying area, or shall otherwise conform to the requirements of paragraph (c) of this section.

(4) *Support.* Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from the ground. Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators, shall be deemed to comply with this section. Insulators shall be nonporous and noncombustible.

(5) *Insulators, grounding.* High-voltage leads to electrodes shall be properly insulated and protected from mechanical injury or exposure to destructive chemicals. Electrostatic atomizing heads shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding the electrode system when it is electrically deenergized for any reason. All insulators shall be kept clean and dry.

(6) *Safe distance.* A safe distance shall be maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the assembly.

(7) *Conveyors required.* Goods being painted using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent such swinging or movement which would reduce the clearance to less than that specified in subparagraph (6) of this paragraph.

(8) *Prohibition.* This process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment which is manipulated by hand, see paragraph (i) of this section for applicable requirements.

(9) *Fail-safe controls.* Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:

(i) Stoppage of ventilating fans or failure of ventilating equipment from any cause.

(ii) Stoppage of the conveyor carrying goods through the high voltage field.

(iii) Occurrence of a ground or of an imminent ground at any point on the high voltage system.

(iv) Reduction of clearance below that specified in subparagraph (6) of this paragraph.

(10) *Guarding.* Adequate booths, fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing, and guards shall be of conducting material, adequately grounded.

(11) *Ventilation.* Where electrostatic atomization is used the spraying area shall be so ventilated as to insure safe conditions from a fire and health standpoint.

(12) *Fire protection.* All areas used for spraying, including the interior of the booth, shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

(i) *Electrostatic hand spraying equipment*—(1) *Application.* This paragraph shall apply to any equipment using electrostatically charged elements for the atomization and/or, precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.

(2) *Conformance.* Electrostatic hand spraying equipment shall conform with the other provisions of this section.

(3) *Equipment approval and specifications.* Electrostatic hand spray apparatus and devices used in connection with coating operations shall be of approved types. The equipment should be so designed that the maximum surface temperature of the equipment in the spraying area shall not exceed 150° F. under any condition. The high voltage circuits shall be designed so as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the handgun shall be capable of being energized only by a switch which also controls the coating material supply.

(4) *Electrical support equipment.* Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself and its connections to the power supply shall be located outside of the spraying area or shall otherwise conform to the requirements of paragraph (c) of this section.

(5) *Spray gun ground.* The handle of the spraying gun shall be electrically connected to ground by a metallic connection and to be so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.

(6) *Grounding—general.* All electrically conductive objects in the spraying area shall be adequately grounded. This requirement shall apply to paint containers, wash cans, and any other objects or devices in the area. The equipment shall carry a prominent permanently installed warning regarding the necessity for this grounding feature.

(7) *Maintenance of grounds.* Objects being painted or coated shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to insure this contact and areas of contact shall be sharp points or knife edges where possible. Points of support of the object shall be concealed from random spray where feasible and where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be so located as to not collect spray material during normal operation.

(8) *Interlocks.* The electrical equipment shall be so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.

(9) *Ventilation.* The spraying operation shall take place within a spray area which is adequately ventilated to remove solvent vapors released from the operation.

(j) *Drying, curing, or fusion apparatus*—(1) *Conformance.* Drying, curing, or fusion apparatus in connection with spray application of flammable and combustible finishes shall conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, where applicable and shall also conform with the following requirements of this subparagraph.

(2) *Alternate use prohibited.* Spray booths, rooms, or other enclosures used for spraying operations shall not alternately be used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.

(3) *Adjacent system interlocked.* Except as specifically provided in subparagraph (4) of this paragraph, drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks shall not be installed in a spraying area, but may be installed adjacent thereto when equipped with an interlocked ventilating system arranged to:

(i) Thoroughly ventilate the drying space before the heating system can be started;

(ii) Maintain a safe atmosphere at any source of ignition;

(iii) Automatically shut down the heating system in the event of failure of the ventilating system.

(4) *Alternate use permitted.* Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus when conforming with the following:

(i) Interior (especially floors) of spray enclosures shall be kept free of overspray deposits.

(ii) During spray operations, the drying apparatus and electrical connections and wiring thereto shall not be located within spray enclosure nor in any other location where spray residues may be deposited thereon.

(iii) The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:

(*a*) The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.

(*b*) The spray enclosure will be purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized.

(*c*) The ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus will automatically shut off in the event of failure of the ventilating system.

(iv) All electrical wiring and equipment of the drying apparatus shall conform with the applicable sections of Subpart S of this Part. Only equipment of a type approved for Class I, Division 2 hazardous locations shall be located within 18 inches of floor level. All metallic parts of the drying apparatus shall be properly electrically bonded and grounded.

(v) The drying apparatus shall contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus.

(k) *Automobile undercoating in garages.* Automobile undercoating spray operations in garages, conducted in areas having adequate natural or mechanical ventilation, are exempt from the requirements pertaining to spray finishing operations, when using undercoating materials not more hazardous than kerosene (as listed by Underwriters' Laboratories in respect to fire hazard rating 30–40) or undercoating materials using only solvents listed as having a flash point in excess of 100° F. Undercoating spray operations not conforming to these provisions are subject to all requirements of this section pertaining to spray finishing operations.

(l) *Powder coating*—(1) *Electrical and other sources of ignition.* Electrical equipment and other sources of ignition shall conform to the requirements of paragraph (c)(1) (i)–(iv), (8) and (9) (i) of this section and Subpart S of this Part.

(2) *Ventilation.* (i) In addition to the provisions of paragraph (d) of this section, where applicable, exhaust ventilation shall be sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied. All nondeposited air-suspended powders shall be safely removed via exhaust ducts to the powder recovery cyclone or receptacle. Each installation shall be designed and operated to meet the foregoing performance specification.

(ii) Powders shall not be released to the outside atmosphere.

(3) *Drying, curing, or fusion equipment.* The provisions of the Standard for ovens and furnaces, NFPA No. 86A–1969 shall apply where applicable.

(4) *Operation and maintenance.* (i) All areas shall be kept free of the accumulation of powder coating dusts, particularly such horizontal surfaces as ledges, beams, pipes, hoods, booths, and floors.

(ii) Surfaces shall be cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.

(iii) "No Smoking" signs in large letters on contrasting color background shall be conspicuously posted at all powder coating areas and powder storage rooms.

(5) *Fixed electrostatic spraying equipment.* The provisions of paragraph (h) of this section and other subparagraphs of this paragraph shall apply to fixed electrostatic equipment, except that electrical equipment not covered therein shall conform to subparagraph (1) of this paragraph.

(6) *Electrostatic hand spraying equipment.* The provisions of paragraph (i) of this section and other subparagraphs of this paragraph, shall apply to electrostatic handguns when used in powder coating, except that electrical equipment not covered therein shall conform to subparagraph (1) of this paragraph.

(7) *Electrostatic fluidized beds.* (i) Electrostatic fluidized beds and associated equipment shall be of approved types. The maximum surface temperature of this equipment in the coating area shall not exceed 150° F. The high voltage circuits shall be so designed as to not produce a spark of sufficient intensity to ignite any powder-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions.

(ii) Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the charging electrodes and their connections to the power supply shall be located outside of the powder coating area or shall otherwise conform to the requirements of subparagraph (1) of this paragraph.

(iii) All electrically conductive objects within the charging influence of the electrodes shall be adequately grounded. The powder coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.

(iv) Objects being coated shall be maintained in contact with the conveyor or other support in order to insure proper grounding. Hangers shall be regularly cleaned to insure effective contact and areas of contact shall be sharp points or knife edges where possible.

(v) The electrical equipment shall be so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation.

(m) *Organic peroxides and dual component coatings*—(1) *Conformance.* All spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in approved sprinklered spray booths meeting the requirements of this section.

(2) *Smoking.* Smoking shall be prohibited and "No Smoking" signs shall be prominently displayed and only nonsparking tools shall be used in any area where organic peroxides are stored, mixed or applied.

(n) *Scope.* This section applies to flammable and combustible finishing materials when applied as a spray by compressed air, "airless" or "hydraulic atomization," steam, electrostatic methods, or by any other means in continuous or intermittent processes. The section also covers the application of combustible powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds. The section does not apply to outdoor spray application of buildings, tanks, or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

§ 1910.108 Dip tanks containing flammable or combustible liquids.

(a) *Definitions applicable to this section*—(1) *Dip tank.* Shall mean a tank, vat, or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating, or similar processes.

(2) *Vapor area.* Shall mean any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drainboards or associated drying, conveying, or other equipment, during operation or shutdown periods.

(3) *Approved.* Unless otherwise indicated, approval or listing by at least one of the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factory Mutual Engineering Corp.

(4) *Listed.* See "approved" in paragraph (a)(3) of this section.

(b) *Ventilation*—(1) *Vapor area ventilation.* Vapor areas as defined in paragraph (a)(2) of this section shall be limited to the smallest practical space by maintaining a properly designed system of mechanical ventilation arranged to move air from all directions towards the vapor area origin and thence to a safe outside location. Ventilating systems shall conform to the Standards for Blower and Exhaust Systems (NFPA Pamphlet No. 91–1969). Required ventilating systems shall be so arranged that the failure of any ventilating fan shall automatically stop any dipping conveyor system. See also paragraph (c)(6) of this section.

(2) *Ventilation combined with drying.* When a required ventilating system serves associated drying operations utilizing a heating system which may be a source of ignition, means shall be provided for preventilation before the heating system can be started; the failure of

any ventilating fan shall automatically shut down the heating system; and the installation shall otherwise conform to the Standard for Ovens and Furnaces (NFPA No. 86A–1969).

(c) *Construction of dip tanks*—(1) *General.* Dip tanks, including drainboards if provided, shall be constructed of substantial noncombustible material, and their supports shall be of heavy metal, reinforced concrete, or masonry. Where dip tanks extend through a floor to the story below or where the weakening of the tank supports by fire may result in the tank collapse, supports should be of material having not less than 1-hour fire resistance.

(2) *Overflow pipes.* (i) Dip tanks of over 150 gallons in capacity or 10 square feet in liquid surface area shall be equipped with a properly trapped overflow pipe leading to a safe location outside buildings. Smaller dip tanks should also be so equipped, where practical. The discharge of the overflow pipe should be so located and arranged that if the entire combustible contents of the dip tank is overflowed through overflow pipe by the application of water during fire fighting, property will not be endangered. The size of the overflow pipe should be sufficient to conduct the maximum rate of flow of water expected to be applied to the liquid surface of the dip tank from automatic sprinklers or from other sources in the event of fire.

(ii) Overflow pipes shall be of sufficient capacity to overflow the maximum delivery of dip tank liquid fill pipes but shall not be less than 3 inches in diameter and shall be increased in size depending upon the area of the liquid surface and the length and pitch of pipe.

(iii) Piping connections on drains and overflow lines shall be designed so as to permit ready access for inspection and cleaning of the interior.

(iv) The bottom of the overflow connection shall be not less than 6 inches below the top of the tank. See also subparagraph (6) of this paragraph and paragraph (g) (3) (ii) of this section.

(3) *Bottom drains.* (i) Dip tanks over 500 gallons in liquid capacity shall be equipped with bottom drains automatically and manually arranged to quickly drain the tank in the event of fire, unless the viscosity of the liquid at normal atmospheric temperature makes this impractical. Manual operation shall be from a safely accessible location. Where gravity flow is not practicable, automatic pumps shall be required.

(ii) Such drain shall be trapped and discharge to a closed properly vented salvage tank or to a safe location outside which will not endanger property.

(iii) According to tank capacity the diameter of bottom drainpipe shall be not less than the following:

Gallons:	Inches
500 to 750	3
750 to 1,000	4
1,000 to 2,500	5
2,500 to 4,000	6
Over 4,000	8

(4) *Salvage tanks.* The capacity of the salvage tank shall be greater than the capacity of the dip tank or tanks to which they are connected.

(5) *Automatic extinguishing facilities.* Except as noted in paragraph (h) (1) (v) of this section (applying to hardening and tempering tanks), all dip tanks exceeding 150 gallons liquid capacity or having a liquid surface area exceeding 4 square feet shall be protected with at least one of the automatic extinguishing facilities conforming to paragraph (g) (2), (3), (4), (5), or (6) of this section.

(6) *Conveyor systems.* Dip tanks utilizing a conveyor system shall be so arranged that in the event of fire, the conveyor system shall automatically cease motion and required bottom drains shall open. Conveyor systems shall automatically cease motion unless required ventilation is in full operation. See also paragraph (b) (1) of this section.

(7) *Heating dip tank liquids.* When dip tank liquids are artificially heated, either by the dipping of heated articles, or by other application of heat to the liquid, provision shall be made to prevent a temperature rise greater than 50° F. below the flashpoint of the liquid. See also paragraph (h) (1) of this section.

(d) *Liquids used in dip tanks, storage and handling.* The storage of flammable and combustible liquids in connection with dipping operation shall conform to the requirements of section 1910.106, where applicable. Where portable containers are used for the replenishment of flammable and combustible liquids, provision shall be made so that both the container and tank shall be positively grounded and electrically bonded to prevent static electric sparks.

(e) *Electrical and other sources of ignition*—(1) *Vapor areas.* (i) There shall be no open flames, spark producing devices, or heated surfaces having a temperature sufficient to ignite vapors in any vapor area. Except as specifically permitted in paragraph (h) (3) of this section, relating to electrostatic apparatus, electrical wiring and equipment in any vapor area (as defined in paragraph (a) (2) of this section) shall be explosion proof type according to the requirements of Subpart S of this part for Class I, Group D locations and shall otherwise conform to Subpart S of this part.

(ii) Unless specifically approved for locations containing both deposits of readily ignitable residues and explosive vapors, there shall be no electrical equipment in the vicinity of dip tanks or associated drainboards or drying operations which are subject to splashing or dripping of dip tank liquids, except wiring in rigid conduit or in threaded boxes or fittings containing no taps, splices, or terminal connections, and except as specifically permitted in paragraph (h) (3) of this section.

(2) *Adjacent areas.* In any floorspace outside a vapor area but within 20 feet therefrom, and not separated by tight partitions, there shall be no open flames or spark producing devices except as specifically permitted in NFPA Standard No. 86A–1969, Ovens and Furnaces, paragraph 200–7, and electrical wiring and equipment shall conform to the provisions of Subpart S of this part.

(f) *Operations and maintenance*—(1) *General.* Areas in the vicinity of dip tanks shall be kept as clear of combustible stock as practical and shall be kept entirely free of combustible debris.

(2) *Waste cans.* When waste or rags are used in connection with dipping operations, approved metal waste cans shall be provided and all impregnated rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at least once daily at the end of each shift.

(3) *Inspection.* Periodic inspection or tests of all dip tank facilities shall be made, including covers, overflow pipe inlets and discharge, bottom drains and valves, electrical wiring and equipment and grounding connections, ventilating facilities, and all extinguishing equipment. Any defects found shall be promptly corrected.

(4) *Warning signs.* "No Smoking" signs in large letters on contrasting color background shall be conspicuously posted in the vicinity of dip tanks.

(g) *Extinguishment*—(1) *Extinguishers.* Areas in the vicinity of dip tanks shall be provided with manual fire extinguishers suitable for flammable and combustible liquid fires, conforming to Standard for Portable Fire Extinguishers NFPA No. 10–1970.

(2) *Automatic water spray extinguishing systems.* Such systems shall conform to NFPA Standard for Water Spray Systems for Fire Protection NFPA No. 15–1969 and shall be arranged to protect tanks, drainboards, and stock over drainboards.

(3) *Automatic foam extinguishing systems.* Automatic foam extinguishing systems shall conform to NFPA Standard for Foam Extinguishing Systems, NFPA No. 11–1970 and;

(i) Foam producing material selected shall be suitable for intended use, taking into account characteristics of the dip tank liquid;

(ii) Overflow pipe shall be arranged to prevent the floating away of foam and clogging overflow pipe. This may be accomplished by either of the following:

(*a*) Overflow pipe may be extended through tank wall and terminated in an ell pointing downward. The bottom of the overflow pipe at the point it pierces tank wall should not be over 2 inches above the opening or face of the ell.

(*b*) Overflow pipe inlet may be provided with a removable screen of ¼-inch mesh having an area at least twice the cross-sectional area of overflow pipe. Screens which may be clogged by dip tank ingredients shall be inspected and cleaned periodically.

(4) *Automatic carbon dioxide systems.* Automatic carbon dioxide systems shall conform to NFPA Standard for Carbon Dioxide Extinguishing Systems, NFPA No. 12–1968, and shall be arranged to

protect both dip tanks and drainboards and unless stock over drainboards is otherwise protected with automatic extinguishing facilities, shall also be arranged to protect such stock.

(5) *Dry chemical extinguishing systems.* Dry chemical extinguishing systems shall conform to NFPA Standard for Dry Chemical Extinguishing Systems NFPA No. 17–1969 and shall be arranged to protect both dip tanks and drainboards, and unless stock over drainboards is otherwise protected with automatic extinguishing facilities, shall also be arranged to protect such stock.

(6) *Dip tank covers.* (i) Covers arranged to close automatically in the event of fire shall be actuated by approved automatic devices and shall also be arranged for manual operation.

(ii) Covers shall be of substantial noncombustible material or of tin-clad type with enclosing metal applied with locked joints.

(iii) Chains or wire rope shall be used for cover support or operating mechanism where the burning of a cord would interfere with the action of a device.

(iv) Covers shall be kept closed when tanks are not in use.

(h) *Special dip tank applications*—(1) *Hardening and tempering tanks.* (i) Tanks shall be located as far as practicable from furnaces and shall not be located on or near combustible floors.

(ii) Tanks shall be provided with a noncombustible hood and vent or other equally effective means of venting to the outside of the building to serve as a vent in case of fire. All such vent ducts shall be treated as flues and be kept well away from combustible roofs or materials.

(iii) Tanks shall be so designed that the maximum workload is incapable of raising the temperature of the cooling medium to within 50° below its flashpoint, or such tanks shall be equipped with circulating cooling systems which will accomplish the same result.

(iv) Tanks shall be equipped with a high temperature limit switch arranged to sound an alarm when the temperature of the quenching medium reaches within 50° F. below the flashpoint. If practical from an operating standpoint, such limit switches shall also shut down conveying equipment supplying work to the tank.

(v) The provisions of paragraph (c)(5) of this section shall apply to tanks having a liquid surface area of 25 square feet or more or a capacity of 500 gallons or more.

(vi) Air under pressure shall not be used to fill or to agitate oil tanks.

(vii) Drain facilities from the bottom of the tank may be combined with the oil circulating system or arranged independently to drain the oil to a safe location. The drain valve shall be operated automatically with approved heat actuated devices or manually, and if the latter, the valve shall be operated from a safe distance.

(2) *Flow coat; general.* (i) Except as modified in this paragraph, all of the preceding standards for dip tanks apply.

(ii) All piping shall be strongly erected and rigidly supported.

(iii) Paint shall be supplied by direct low-pressure pumping arranged to automatically shut down by means of approved heat actuated devices, in the case of fire, or paint may be supplied by a gravity tank not exceeding 10 gallons in capacity.

(iv) The area of the sump and any areas on which paint flows should be considered the area of dip tank.

(3) *Electrostatic apparatus; general.* (i) Installation and use of electrostatic detearing equipment shall conform to paragraphs (a) through (g) of this section.

(ii) Electrostatic apparatus and devices used in connection with paint detearing operations shall be of approved types.

(iii) Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of high voltage grids and their connections, shall be located outside the vapor area or shall conform to the requirements of paragraph (e) of this section.

(iv) Electrodes shall be of substantial construction, shall be rigidly supported in permanent locations and shall be effectively insulated from ground. Insulators shall be nonporous and noncombustible.

(v) High voltage leads to electrodes shall be effectively and permanently supported on suitable insulators, and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding and discharging any accumulated residual charge on the electrode assembly or the secondary circuit of the high voltage transformer when the transformer primary is disconnected from the source of supply.

(vi) A space shall be maintained between goods being deteared and electrodes or conductors of at least twice the sparking distance. A suitable sign stating the sparking distance shall be conspicuously posted near the assembly.

(vii) Goods being deteared using this electrostatic process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes at all times. All goods shall be so supported as to prevent any swinging or movement which would reduce the clearance to less than specified in subdivision (vi) of this subparagraph.

(viii) This electrostatic process is not approved where goods being deteared are manipulated by hand.

(ix) Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:

(*a*) Stoppage of ventilating fans or failure of ventilating equipment from any cause.

(*b*) Stoppage of the conveyor carrying goods past the high voltage grid.

(*c*) Occurrence of a ground or of an imminent ground at any point on the high voltage system.

(*d*) Reduction of clearance below that specified in subdivision (vi) of this subparagraph.

(x) Adequate fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing and guards shall be of conducting material, adequately grounded, and should be at least 5 feet from processing equipment.

(xi) Electrode insulators shall be kept clean and dry.

(xii) The detearing area shall be ventilated by exhausting adequate air from the area as specified in paragraph (b) of this section.

(xiii) All areas for detearing shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

(xiv) Drip plates and screens subject to paint deposits shall be removable and shall be taken to a safe place for cleaning.

(4) *Roll coating.* (i) The processes of roll coating, spreading, and impregnating, in which fabrics, paper, or other material are passed directly through a tank or trough containing flammable or combustible liquids, or over the surface of a roller that revolves partially submerged in a flammable liquid, shall conform to the applicable requirements of paragraphs (a) through (g) of this section and in addition shall conform to subdivision (ii) of this subparagraph.

(ii) Adequate arrangements shall be made to prevent sparks from static electricity by electrically bonding and grounding all metallic rotating and other parts of machinery and equipment and by the installation of static collectors or maintaining a conductive atmosphere such as a high relative humidity.

§ 1910.109 Explosives and blasting agents.

(a) *Definitions applicable to this section*—(1) *Blasting agent.* Blasting agent—any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive and in which none of the ingredients are classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

(2) *Explosive-actuated power devices.* Explosive-actuated power device—any tool or special mechanized device which is actuated by explosives, but not including propellant-actuated power devices.

Examples of explosive-actuated power devices are jet tappers and jet perforators.

(3) *Explosive.* Explosive—any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified by the U.S. Department of Transportation; see 49 CFR Chapter I. The term "explosives" shall include all material which is classified as Class A, Class B, and Class C explosives by the U.S. Department of Transportation, and includes, but is not limited to dynamite, black powder, pellet powders, initiating explosives, blasting caps, electric blasting caps, safety fuse, fuse lighters, fuse igniters, squibs, cordeau detonant fuse, instantaneous fuse, igniter cord, igniters, small arms ammunition, small arms ammunition primers, smokeless propellant, cartridges for propellant-actuated power devices, and cartridges for industrial guns. Commercial explosives are those explosives which are intended to be used in commercial or industrial operations.

NOTE 1: Classification of explosives is described by the U.S. Department of Transportation as follows (see 49 CFR Chapter I):

(i) *Class A explosives.* Possessing, detonating, or otherwise maximum hazard; such as dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder, blasting caps, and detonating primers.

(ii) *Class B explosives.* Possessing flammable hazard, such as propellant explosives (including some smokeless propellants), photographic flash powders, and some special fireworks.

(iii) *Class C explosives.* Includes certain types of manufactured articles which contain Class A or Class B explosives, or both, as components but in restricted quantities.

(iv) *Forbidden or not acceptable explosives.* Explosives which are forbidden or not acceptable for transportation by common carriers by rail freight, rail express, highway, or water in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Chapter I.

(4) *Highway.* Highway—any public street, public alley, or public road.

(5) *Inhabited building.* Inhabited building—a building or structure regularly used in whole or part as a place of human habitation. The term "inhabited building" shall also mean any church, school, store, railway passenger station, airport terminal for passengers, and any other building or structure where people are accustomed to congregate or assemble but excluding any building or structure occupied in connection with the manufacture, transportation, storage, and use of explosives.

(6) *Magazine.* Magazine—any building or structure, other than an explosives manufacturing building, used for the storage of explosives.

(7) *Motor vehicle.* Motor vehicle—any self-propelled vehicle, truck, tractor, semitrailer, or truck-full trailers used for the transportation of freight over public highways.

(8) *Propellant-actuated power devices.* Propellant-actuated power devices—any tool or special mechanized device or gas generator system which is actuated by a smokeless propellant or which releases and directs work through a smokeless propellant charge.

(9) *Public conveyance.* Public conveyance—any railroad car, streetcar, ferry, cab, bus, airplane, or other vehicle which is carrying passengers for hire.

(10) *Pyrotechnics.* Pyrotechnics—any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects which are commonly referred to as fireworks.

(11) *Railway.* Railway—any steam, electric, diesel electric, or other railroad or railway which carries passengers for hire on the particular line or branch in the vicinity where explosives are stored or where explosives manufacturing buildings are situated.

(12) *Semiconductive hose.* Semiconductive hose—a hose with an electrical resistance high enough to limit flow of stray electric currents to safe levels, yet not so high as to prevent drainage of static electric charges to ground; hose of not more than 2 megohms resistance over its entire length and of not less than 5,000 ohms per foot meets the requirement.

(13) *Small arms ammunition.* Small arms ammunition—any shotgun, rifle, pistol, or revolver cartridge, and cartridges for propellant-actuated power devices and industrial guns. Military-type ammunition containing explosive-bursting charges, incendiary, tracer, spotting, or pyrotechnic projectiles is excluded from this definition.

(14) *Small arms ammunition primers.* Small arms ammunition primers—small percussion-sensitive explosive charges, encased in a cup, used to ignite propellant powder.

(15) *Smokeless propellants.* Smokeless propellants—solid propellants, commonly called smokeless powders in the trade, used in small arms ammunition, cannon, rockets, propellant-actuated power devices, etc.

(16) *Special industrial explosives devices.* Special industrial explosives devices—explosive-actuated power devices and propellant-actuated power devices.

(17) *Special industrial explosives materials.* Special industrial explosives materials—shaped materials and sheet forms and various other extrusions, pellets, and packages of high explosives, which include dynamite, trinitrotoluene (TNT), pentaerythritol tetranitrate (PETN), hexahydro-1,3,5-trinitro-s-triazine (RDX), and other similar compounds used for high-energy-rate forming, expanding, and shaping in metal fabrication, and for dismemberment and quick reduction of scrap metal.

(18) *Water gels or slurry explosives.* These comprise a wide variety of materials used for blasting. They all contain substantial proportions of water and high proportions of ammonium nitrate, some of which is in solution in the water. Two broad classes of water gels are (i) those which are sensitized by a material classed as an explosive, such as TNT or smokeless powder, (ii) those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum or with other fuels. Water gels may be premixed at an explosives plant or mixed at the site immediately before delivery into the borehole.

(19) *DOT specifications.* Regulations of the Department of Transportation published in 49 CFR Chapter I.

(20) *DOT regulations.* See § 1910.109 (a) (19).

(21) *DOT requirements.* See § 1910.109 (a) (19).

(b) *Miscellaneous provisions* — (1) *General hazard.* No person shall store, handle, or transport explosives or blasting agents when such storage, handling, and transportation of explosives or blasting agents constitutes an undue hazard to life and property.

(2) *Unauthorized recipients.* No person shall sell or give away any explosive or blasting agent to any unauthorized person.

(3) *Display.* No person shall sell, display, or expose for sale any explosive or blasting agent on any highway, street, sidewalk, public way, or public place.

(c) *Storage of explosives*—(1) *General provisions.* (i) All Class A, Class B, Class C explosives, and special industrial explosives, and any newly developed and unclassified explosives, shall be kept in magazines which meet the requirements of this paragraph.

(ii) Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives.

(iii) Ground around magazines shall slope away for drainage. The land surrounding magazines shall be kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet.

(iv) Magazines as required by this paragraph shall be of two classes; namely, Class I magazines, and Class II magazines.

(v) Class I magazines shall be required where the quantity of explosives stored is more than 50 pounds. Class II magazines may be used where the quantity of explosives stored is 50 pounds or less.

(vi) Class I magazines shall be located away from inhabited buildings, passenger railways, and public highways and from other magazines in conformity with Table H–21.

TABLE H-21—AMERICAN TABLE OF DISTANCES FOR STORAGE OF EXPLOSIVES

As revised and approved by the Institute of Makers of Explosives, June 5, 1964

Explosives		Distances in feet when storage is barricaded			
Pounds over	Pounds not over	Inhabited buildings	Passenger railways	Public highways	Separation of magazines
2	5	70	30	30	6
5	10	90	35	35	8
10	20	110	45	45	10
20	30	125	50	50	11
30	40	140	55	55	12
40	50	150	60	60	14
50	75	170	70	70	15
75	100	190	75	75	16
100	125	200	80	80	18
125	150	215	85	85	19
150	200	235	95	95	21
200	250	255	105	105	23
250	300	270	110	110	24
300	400	295	120	120	27
400	500	320	130	130	29
500	600	340	135	135	31
600	700	355	145	145	32
700	800	375	150	150	33
800	900	390	155	155	35
900	1,000	400	160	160	36
1,000	1,200	425	170	165	39
1,200	1,400	450	180	170	41
1,400	1,600	470	190	175	43
1,600	1,800	490	195	180	44
1,800	2,000	505	205	185	45
2,000	2,500	545	220	190	49
2,500	3,000	580	235	195	52
3,000	4,000	635	255	210	58
4,000	5,000	685	275	225	61
5,000	6,000	730	295	235	65
6,000	7,000	770	310	245	68
7,000	8,000	800	320	250	72
8,000	9,000	835	335	255	75
9,000	10,000	865	345	260	78
10,000	12,000	875	370	270	82
12,000	14,000	885	390	275	87
14,000	16,000	900	405	280	90
16,000	18,000	940	420	285	94
18,000	20,000	975	435	290	98
20,000	25,000	1,055	470	315	105
25,000	30,000	1,130	500	340	112
30,000	35,000	1,205	525	360	119
35,000	40,000	1,275	550	380	124
40,000	45,000	1,340	570	400	129
45,000	50,000	1,400	590	420	135
50,000	55,000	1,460	610	440	140
55,000	60,000	1,515	630	455	145
60,000	65,000	1,565	645	470	150
65,000	70,000	1,610	660	485	155
70,000	75,000	1,655	675	500	160
75,000	80,000	1,695	690	510	165
80,000	85,000	1,730	705	520	170
85,000	90,000	1,760	720	530	175
90,000	95,000	1,790	730	540	180
95,000	100,000	1,815	745	545	185
100,000	110,000	1,835	770	550	195
110,000	120,000	1,855	790	555	205
120,000	130,000	1,875	810	560	215
130,000	140,000	1,890	835	565	225
140,000	150,000	1,900	850	570	235
150,000	160,000	1,935	870	580	245
160,000	170,000	1,965	890	590	255
170,000	180,000	1,990	905	600	265
180,000	190,000	2,010	920	605	275
190,000	200,000	2,030	935	610	285
200,000	210,000	2,055	955	620	295
210,000	230,000	2,100	980	635	315
230,000	250,000	2,155	1,010	650	335
250,000	275,000	2,215	1,040	670	360
275,000	300,000	2,275	1,075	690	385

NOTE 1. "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

NOTE 2. "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of three feet.

NOTE 3. "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point 12 feet above the center of a railway or highway, will pass through such intervening natural or artificial barricade.

NOTE 4. When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and in addition, they should be separated from each other by not less than the distances shown for "Separation of Magazines," except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified "Separation of Magazines" distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum of distances specified from other magazines, inhabited buildings, railways, and highways.

NOTE 5. This table applies only to the manufacture and permanent storage of commercial explosives. It is not applicable to transportation of explosives, or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

(vii) Except as provided in subdivision (viii) of this subparagraph, class II magazines shall be located in conformity with Table H-21, but may be permitted in warehouses and in wholesale and retail establishments when located on a floor which has an entrance at outside grade level and the magazine is located not more than 10 feet from such an entrance. Two class II magazines may be located in the same building when one is used only for blasting caps in quantities not in excess of 5,000 caps and a distance of 10 feet is maintained between magazines.

(viii) When used for temporary storage at a site for blasting operations, class II magazines shall be located away from neighboring inhabited buildings, railways, highways, and other magazines. A distance of at least one hundred and fifty (150) feet shall be maintained between class II magazines and the work in progress when the quantity of explosives kept therein is in excess of 25 pounds, and at least 50 feet when the quantity of explosives is 25 pounds, or less.

(ix) This paragraph (c) does not apply to:

(*a*) Stocks of small arms ammunition, propellant-actuated power cartridges, small arms ammunition primers in quantities of less than 750,000, or of smokeless propellants in quantities less than 750 pounds;

(*b*) Explosive-actuated power devices when in quantities less than 50 pounds net weight of explosives;

(*c*) Fuse lighters and fuse igniters;

(*d*) Safety fuses other than cordeau detonant fuses.

(2) *Construction of magazines—general.* (i) Magazines shall be constructed in conformity with the provisions of this paragraph.

(ii) Magazines for the storage of explosives, other than black powder, Class B and Class C explosives shall be bullet resistant, weather resistant, fire resistant, and ventilated sufficiently to protect the explosive in the specific locality. Magazines used only for storage of black powder, Class B and Class C explosives shall be weather resistant, fire-resistant, and have ventilation. Magazines for storage of blasting and electric blasting caps shall be weather resistant, fire-resistant, and ventilated.

(iii) Property upon which Class I magazines are located and property where Class II magazines are located outside of buildings shall be posted with signs reading "Explosives—Keep Off." Such signs shall be located so as to minimize the possibility of a bullet traveling in the direction of the magazine if anyone shoots at the sign.

(iv) Magazines requiring heat shall be heated by either hot-water radiant heating with the magazine building; or air directed into the magazine building over either hot water or low pressure steam (15 p.s.i.g.) coils located outside the magazine building.

(v) The magazine heating systems shall meet the following requirements:

(*a*) The radiant heating coils within the building shall be installed in such a manner that the explosives or explosives containers cannot contact the coils and air is free to circulate between the coils and the explosives or explosives containers.

(*b*) The heating ducts shall be installed in such a manner that the hot-air discharge from the duct is not directed against the explosives or explosives containers.

(*c*) The heating device used in connection with a magazine shall have controls which prevent the ambient building temperature from exceeding 130° F.

(*d*) The electric fan or pump used in the heating system for a magazine shall be mounted outside and separate from the wall of the magazine and shall be grounded.

(*e*) The electric fan motor and the controls for electrical heating devices used in heating water or steam shall have overloads and disconnects, which comply with subpart S of this part. All electrical switch gear shall be located a minimum distance of 25 feet from the magazine.

(*f*) The heating source for water or steam shall be separated from the magazine by a distance of not less than 25 feet when electrical and 50 feet when fuel fired. The area between the heating unit and the magazine shall be cleared of all combustible materials.

(*g*) The storage of explosives and explosives containers in the magazine shall allow uniform air circulation so product temperature uniformity can be maintained.

(vi) When lights are necessary inside the magazine, electric safety flashlight, or electric safety lanterns shall be used.

(3) *Construction of class I magazines.* (i) Class I magazines shall be of masonry construction or of wood or of metal construction, or a combination of these types. Thickness of masonry units shall

not be less than 8 inches. Hollow masonry units used in construction required to be bullet resistant shall have all hollow spaces filled with weak cement or well-tamped sand. Wood constructed walls, required to be bullet resistant, shall have at least a 6-inch space between interior and exterior sheathing and the space between sheathing shall be filled with well-tamped sand. Metal wall construction, when required to be bullet resistant, shall be lined with brick at least 4 inches in thickness or shall have at least a 6-inch sandfill between interior and exterior walls.

(ii) Floors and roofs of masonry magazines may be of wood construction. Wood floors shall be tongue and grooved lumber having a nominal thickness of 1 inch.

(iii) Roofs required to be bullet resistant shall be protected by a sand tray located at the line of eaves and covering the entire area except that necessary for ventilation. Sand in the sand tray shall be maintained at a depth of not less than 4 inches.

(iv) All wood at the exterior of magazines, including eaves, shall be protected by being covered with black or galvanized steel or aluminum metal of thickness of not less than No. 26 gage. All nails exposed to the interior of magazines shall be well countersunk.

(v) Foundations for magazines shall be of substantial construction and arranged to provide good cross ventilation.

(vi) Magazines shall be ventilated sufficiently to prevent dampness and heating of stored explosives. Ventilating openings shall be screened to prevent the entrance of sparks.

(vii) Openings to magazines shall be restricted to that necessary for the placement and removal of stocks of explosives. Doors for openings in magazines for Class A explosives shall be bullet resistant. Doors for magazines not required to be bullet resistant shall be designed to prevent unauthorized entrance to the magazine.

(viii) Magazines shall be provided with substantial means for locking; locks shall be provided and magazine doors shall be kept locked, except during the time of placement and removal of stocks of explosives.

(ix) Provisions shall be made to prevent the piling of stocks of explosives directly against masonry walls, brick-lined or sand-filled metal walls and single-thickness metal walls; such protection, however, shall not interfere with proper ventilation at the interior of side and end walls.

(4) *Construction of Class II magazines*. (i) Class II magazines shall be of wood or metal construction, or a combination thereof.

(ii) Wood magazines of this class shall have sides, bottom, and cover constructed of 2-inch hardwood boards well braced at corners and protected by being entirely covered with sheet metal of not less than No. 20 gage. All nails exposed to the interior of the magazine shall be well countersunk. All metal magazines of this class shall have sides, bottom, and cover constructed of sheet metal, and shall be lined with three-eighths-inch plywood or equivalent. Edges of metal covers shall overlap sides at least 1 inch.

(iii) Covers for both wood- and metal-constructed magazines of this class shall be provided with substantial strap hinges and shall be provided with substantial means for locking. Covers shall be kept locked except during the placement or removal of explosives.

(iv) Magazines of this class shall be painted red and shall bear lettering in white, on all sides and top, at least 3 inches high, "Explosives—Keep Fire Away." Class II magazines when located in warehouses, and in wholesale and retail establishments shall be provided with substantial wheels or casters to facilitate easy removal in the case of fire. Where necessary due to climatic conditions, Class II magazines shall be ventilated.

(5) *Storage within magazines*. (i) Packages of explosives shall be laid flat with top side up. Black powder when stored in magazines with other explosives shall be stored separately. Black powder stored in kegs shall be stored on ends, bungs down, or on side, seams down. Corresponding grades and brands shall be stored together in such a manner that brands and grade marks show. All stocks shall be stored so as to be easily counted and checked. Packages of explosives shall be piled in a stable manner. When any kind of explosive is removed from a magazine for use, the oldest explosive of that particular kind shall always be taken first.

(ii) Packages of explosives shall not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives. Tools used for opening packages of explosives shall be constructed of nonsparking materials, except that metal slitters may be used for opening fiberboard boxes. A wood wedge and a fiber, rubber, or wood mallet shall be used for opening or closing wood packages of explosives. Opened packages of explosives shall be securely closed before being returned to a magazine.

(iii) Magazines shall not be used for the storage of any metal tools nor any commodity except explosives, but this restriction shall not apply to the storage of blasting agents and blasting supplies.

(iv) Magazine floors shall be regularly swept, kept clean, dry, free of grit, paper, empty used packages, and rubbish. Brooms and other cleaning utensils shall not have any spark-producing metal parts. Sweepings from floors of magazines shall be properly disposed of. Magazine floors stained with nitroglycerin shall be cleaned according to instructions by the manufacturer.

(v) When any explosive has deteriorated to an extent that it is in an unstable or dangerous condition, or if nitroglycerin leaks from any explosives, then the person in possession of such explosive shall immediately proceed to destroy such explosive in accordance with the instructions of the manufacturer. Only experienced persons shall be allowed to do the work of destroying explosives.

(vi) When magazines need inside repairs, all explosives shall be removed therefrom and the floors cleaned. In making outside repairs, if there is a possibility of causing sparks or fire the explosives shall be removed from the magazine. Explosives removed from a magazine under repair shall either be placed in another magazine or placed a safe distance from the magazine where they shall be properly guarded and protected until repairs have been completed, when they shall be returned to the magazine.

(vii) Smoking, matches, open flames, spark-producing devices, and firearms (except firearms carried by guards) shall not be permitted inside of or within 50 feet of magazines. The land surrounding a magazine shall be kept clear of all combustible materials for a distance of at least 25 feet. Combustible materials shall not be stored within 50 feet of magazines.

(viii) Magazines shall be in the charge of a competent person at all times who shall be at least 21 years of age, and who shall be held responsible for the enforcement of all safety precautions.

(ix) Explosives recovered from blasting misfires shall be placed in a separate magazine until competent personnel has determined from the manufacturer the method of disposal. Caps recovered from blasting misfires shall not be reused. Such explosives and caps shall then be disposed of in the manner recommended by the manufacturer.

(d) *Transportation of explosives*—(1) *General provisions*. (i) No employee shall be allowed to smoke, carry matches or any other flame-producing device, or carry any firearms or loaded cartridges while in or near a motor vehicle transporting explosives; or drive, load, or unload such vehicle in a careless or reckless manner.

(ii) Explosives shall not be carried or transported in or upon a public conveyance or vehicle carrying passengers for hire.

(iii) Explosives shall not be transferred from one vehicle to another within the confines of any jurisdiction (city, county, State, or other area) without informing the fire and police departments thereof. In the event of breakdown or collision the local fire and police departments shall be promptly notified to help safeguard such emergencies. Explosives shall be transferred from the disabled vehicle to another only, when proper and qualified supervision is provided.

(iv) Blasting caps or electric blasting caps shall not be transported over the highways on the same vehicles with other explosives.

(2) *Transportation vehicles*. (i) Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and be in good mechanical condition. If vehicles do not have a closed body, the body shall be covered with a flameproof and moisture-proof tarpaulin or other effective protection against moisture and sparks. All vehicles used for the transportation of

explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood or other nonsparking materials to prevent contact with packages of explosives. Packages of explosives shall not be loaded above the sides of an open-body vehicle.

(ii) Every vehicle used for transporting explosives and oxidizing materials listed in (*a*) of this subdivision shall be marked as follows:

(*a*) Exterior markings or placards required on applicable vehicles shall be as follows for the various classes of commodities:

Commodity	*Type of marking or placard*
Explosives, Class A, any quantity or a combination of Class A and Class B explosives.	Explosives A (Red letters on white background).
Explosives, Class B, any quantity.	Explosives B (Red letters on white background).
Oxidizing material (blasting agents, ammonium nitrate, etc.), 1,000 pounds or more gross weight.	Oxidizers (Yellow letters on black background).

(*b*) Each marking or placard shall consist of letters not less than 4 inches high, in the color specified, using approximately a ⅝-inch stroke. The placard must be larger than the lettering required thereon by at least 1 inch at the top and bottom sides. Such marking or placard described in subdivision (*a*) shall be contained in an area on the vehicle which has no other marking, lettering, or graphic display, for at least 3 inches in each direction.

(*c*) Such markings or placards shall be displayed at the front, rear, and on each side of the motor vehicle or trailer, or other cargo carrying body while it contains explosives or other dangerous articles of such type and in such quantity as specified in (*a*) of this subdivision. The front marking or placard may be displayed on the front of either the truck, truck body, truck tractor or the trailer.

(*d*) Any motor vehicle, trailer, or other cargo-carrying body containing more than one kind of explosive as well as an oxidizing material requiring a placard under the provisions of subdivision (*a*), the aggregate gross weight of which totals 1,000 pounds or more, shall be marked or placarded "Dangerous" as well as "Explosive A" or "Explosive B" as appropriate. If explosives Class A and explosives Class B are loaded on the same vehicle, the "Explosives B" marking need not be displayed.

(*e*) In any combination of two or more vehicles containing explosives or other dangerous articles each vehicle shall be marked or placarded as to its contents and in accordance with (*a*) and (*c*) of this subdivision.

(iii) Each motor vehicle used for transporting explosives shall be equipped with a minimum of two extinguishers, each having a rating of at least 10–BC.

(*a*) Only extinguishers listed or approved by Underwriters Laboratories, Inc., or the Factory Mutual Engineering Corp. shall be deemed suitable for use on explosives-carrying vehicles.

(*b*) Extinguishers shall be filled and ready for immediate use and located near the driver's seat. Extinguishers shall be examined periodically by a competent person.

(iv) A motor vehicle used for transporting explosives shall be given the following inspection to determine that it is in proper condition for safe transportation of explosives:

(*a*) Fire extinguishers shall be filled and in working order.

(*b*) All electrical wiring shall be completely protected and securely fastened to prevent short-circuiting.

(*c*) Chassis, motor, pan, and underside of body shall be reasonably clean and free of excess oil and grease.

(*d*) Fuel tank and feedline shall be secure and have no leaks.

(*e*) Brakes, lights, horn, windshield wipers, and steering apparatus shall function properly.

(*f*) Tires shall be checked for proper inflation and defects.

(*g*) The vehicle shall be in proper condition in every other respect and acceptable for handling explosives.

(3) *Operation of transportation vehicles.* (i) Vehicles transporting explosives shall only be driven by and be in the charge of a driver who is physically fit, careful, capable, reliable, able to read and write the English language, and not addicted to the use, or under the influence of intoxicants, narcotics, or other dangerous drugs, and not less than 21 years of age. He shall be familiar with the traffic regulations, State laws, and the provisions of this section.

(ii) Except under emergency conditions, no vehicle transporting explosives shall be parked before reaching its destination, even though attended, on any public street adjacent to or in proximity to any bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble.

(iii) Every motor vehicle transporting any quantity of Class A or Class B explosives shall, at all times, be attended by a driver or other attendant of the motor carrier. This attendant shall have been made aware of the class of the explosive material in the vehicle and of its inherent dangers, and shall have been instructed in the measures and procedures to be followed in order to protect the public from those dangers. He shall have been made familiar with the vehicle he is assigned, and shall be trained, supplied with the necessary means, and authorized to move the vehicle when required.

(*a*) For the purpose of this subdivision, a motor vehicle shall be deemed "attended" only when the driver or other attendant is physically on or in the vehicle, or has the vehicle within his field of vision and can reach it quickly and without any kind of interference; "attended" also means that the driver or attendant is awake, alert, and not engaged in other duties or activities which may divert his attention from the vehicle, except for necessary communication with public officers, or representatives of the carrier, shipper, or consignee, or except for necessary absence from the vehicle to obtain food or to provide for his physical comfort.

(*b*) However, an explosive-laden vehicle may be left unattended if parked within a securely fenced or walled area with all gates or entrances locked where parking of such vehicle is otherwise permissible, or at a magazine site established solely for the purpose of storing explosives.

(iv) No spark-producing metal, spark-producing metal tools, oils, matches, firearms, electric storage batteries, flammable substances, acids, oxidizing materials, or corrosive compounds shall be carried in the body of any motor truck and/or vehicle transporting explosives, unless the loading of such dangerous articles and the explosives comply with U.S. Department of Transportation regulations.

(v) Vehicles transporting explosives shall avoid congested areas and heavy traffic. Where routes through congested areas have been designated by local authorities such routes shall be followed.

(vi) Delivery shall only be made to authorized persons and into authorized magazines or authorized temporary storage or handling areas.

(e) *Use of explosives and blasting agents*—(1) *General provisions.* (i) While explosives are being handled or used, smoking shall not be permitted and no one near the explosives shall possess matches, open light or other fire or flame. No person shall be allowed to handle explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.

(ii) Original containers or Class II magazines shall be used for taking detonators and other explosives from storage magazines to the blasting area.

(iii) When blasting is done in congested areas or in close proximity to a structure, railway, or highway or any other installation that may be damaged, the blast shall be covered before firing with a mat constructed so that it is capable of preventing fragments from being thrown.

(iv) Persons authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution, including but not limited to warning signals, flags, barricades, or woven wire mats to insure the safety of the general public and workmen.

(v) Blasting operations shall be conducted during daylight hours.

(vi) Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph, and steam utilities, the blaster shall notify the appropriate representatives of such utilities at least 24 hours in advance of blasting, specifying the location and intended time of such blasting. Verbal notice shall be confirmed with written notice.

(vii) Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent powerlines, dust storms, or other sources of extraneous electricity. These precautions shall include:

(*a*) The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.

(*b*) The posting of signs warning against the use of mobile radio transmitters on all roads within 350 feet of the blasting operations.

(2) *Storage at use sites.* (i) Empty boxes and paper and fiber packing materials which have previously contained high explosives shall not be used again for any purpose, but shall be destroyed by burning at an approved isolated location out of doors, and no person shall be nearer than 100 feet after the burning has started.

(ii) Containers of explosives shall not be opened in any magazine or within 50 feet of any magazine. In opening kegs or wooden cases, no sparking metal tools shall be used; wooden wedges and either wood, fiber or rubber mallets shall be used. Nonsparking metallic slitters may be used for opening fiberboard cases.

(iii) Explosives or blasting equipment that are obviously deteriorated or damaged shall not be used.

(iv) No explosives shall be abandoned.

(3) *Loading of explosives in blast holes.* (i) All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives.

(ii) Tamping shall be done only with wood rods without exposed metal parts, but nonsparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. Primed cartridges shall not be tamped.

(iii) When loading blasting agents pneumatically over electric blasting caps, semiconductive delivery hose shall be used and the equipment shall be bonded and grounded.

(iv) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives shall be immediately returned to an authorized magazine.

(v) Drilling shall not be started until all remaining butts of old holes are examined with a wooden stick for unexploded charges, and if any are found, they shall be refired before work proceeds.

(vi) No person shall be allowed to deepen drill holes which have contained explosives.

(vii) After loading for a blast is completed, all excess blasting caps or electric blasting caps and other explosives shall immediately be returned to their separate storage magazines.

(4) *Initiation of explosive charges.* (i) Only electric blasting caps shall be used for blasting operations in congested districts, or on highways, or adjacent to highways open to traffic, except where sources of extraneous electricity make such use dangerous.

(ii) When fuse is used, the blasting cap shall be securely attached to the safety fuse with a standard-ring type cap crimper. All primers shall be assembled at least 50 feet from any magazine.

(iii) Primers shall be made up only as required for each round of blasting.

(iv) No blasting cap shall be inserted in the explosives without first making a hole in the cartridge for the cap with a wooden punch of proper size or standard cap crimper.

(v) Explosives shall not be extracted from a hole that has once been charged or has misfired unless it is impossible to detonate the unexploded charge by insertion of a fresh additional primer.

(vi) If there are any misfires while using cap and fuse, all persons shall be required to remain away from the charge for at least 1 hour. If electric blasting caps are used and a misfire occurs, this waiting period may be reduced to 30 minutes. Misfires shall be handled under the direction of the person in charge of the blasting and all wires shall be carefully traced and search made for unexploded charges.

(vii) Blasters, when testing circuits to charged holes, shall use only blasting galvanometers designed for this purpose.

(viii) Only the employee making leading wire connections in electrical firing shall be allowed to fire the shot. Leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.

(5) *Warning required.* Before a blast is fired, the employer shall require that a loud warning signal be given by the person in charge, who has made certain that all surplus explosives are in a safe place, all persons and vehicles are at a safe distance or under sufficient cover, and that an adequate warning has been given.

(f) *Explosives at piers, railway stations, and cars or vessels not otherwise specified in this standard*—(1) *Railway cars.* Except in an emergency and with permission of the local authority, no person shall have or keep explosives in a railway car unless said car and contents and methods of loading are in accordance with the U.S. Department of Transportation Regulations for the Transportation of Explosives, 49 CFR Chapter I.

(2) *Packing and marking.* No person shall deliver any explosive to any carrier unless such explosive conforms in all respects, including marking and packing, to the U.S. Department of Transportation Regulations for the Transportation of Explosives.

(3) *Marking cars.* Every railway car containing explosives which has reached its designation, or is stopped in transit so as no longer to be in interstate commerce, shall have attached to both sides and ends of the car, cards with the words "Explosives — Handle Carefully — Keep Fire Away" in red letters at least 1½ inches high on a white background.

(4) *Storage.* Any explosives at a railway facility, truck terminal, pier, wharf, harbor facility, or airport terminal, whether for delivery to a consignee, or forwarded to some other destination, shall be kept in a safe place, isolated as far as practicable and in such manner that they can be easily and quickly removed.

(5) *Hours of transfer.* Explosives shall not be delivered to or received from any railway station, truck terminal, pier, wharf, harbor facility, or airport terminal between the hours of sunset and sunrise.

(g) *Blasting agents*—(1) *General.* Unless otherwise set forth in this paragraph, blasting agents, excluding water gels, shall be transported, stored, and used in the same manner as explosives. Water gels are covered in paragraph (h) of this section.

(2) *Fixed location mixing.* (i) Buildings or other facilities used for mixing blasting agents shall be located, with respect to inhabited buildings, passenger railroads, and public highways, in accordance with Table H–21. In determining the distance separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H–21), the sum of all masses which may propagate (i.e., lie at distances less than prescribed in Table H–22) from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only 50 percent of its weight shall be used because of its reduced blast effects.

(ii) Buildings used for the mixing of blasting agents shall conform to the requirements of this section.

(*a*) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(*b*) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(*c*) All fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(*d*) The building shall be well ventilated.

(*e*) Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside the mixing building.

(*f*) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(iii) Equipment used for mixing blasting agents shall conform to the requirements of this subdivision.

(*a*) The design of the mixer shall minimize the possibility of frictional heating, compaction, and especially confinement. All bearings and drive assemblies shall be mounted outside the mixer and protected against the accumulation of dust. All surfaces shall be accessible for cleaning.

(*b*) Mixing and packaging equipment shall be constructed of materials compatible with the fuel-ammonium nitrate composition.

(*c*) Suitable means shall be provided to prevent the flow of fuel oil to the mixer in case of fire. In gravity flow systems an automatic spring-loaded shutoff valve with fusible link shall be installed.

(iv) The provisions of this subdivision shall be considered when determining blasting agent compositions.

(*a*) The sensitivity of the blasting agent shall be determined by means of a No. 8 test blasting cap at regular intervals and after every change in formulation.

(*b*) Oxidizers of small particle size, such as crushed ammonium nitrate prills or fines, may be more sensitive than coarser products and shall, therefore, be handled with greater care.

(*c*) No hydrocarbon liquid fuel with flashpoint lower than that of No. 2 diesel fuel oil 125° F. minimum shall be used.

(*d*) Crude oil and crankcase oil shall not be used.

(*e*) Metal powders such as aluminum shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weathertight. Solid fuels shall be used in such manner as to minimize dust explosion hazards.

(*f*) Peroxides and chlorates shall not be used.

(v) All electrical switches, controls, motors, and lights located in the mixing room shall conform to the requirements in subpart S of this part for Class II, Division 2 locations; otherwise they shall be located outside the mixing room. The frame of the mixer and all other equipment that may be used shall be electrically bonded and be provided with a continuous path to the ground.

(vi) Safety precautions at mixing plants shall include the requirements of this subdivision.

(*a*) Floors shall be constructed so as to eliminate floor drains and piping into which molten materials could flow and be confined in case of fire.

(*b*) The floors and equipment of the mixing and packaging room shall be cleaned regularly and thoroughly to prevent accumulation of oxidizers or fuels and other sensitizers.

(*c*) The entire mixing and packaging plant shall be cleaned regularly and thoroughly to prevent excessive accumulation of dust.

(*d*) Smoking, matches, open flames, spark-producing devices, and firearms (except firearms carried by guards) shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

(*e*) The land surrounding the mixing plant shall be kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet.

(*f*) Empty ammonium nitrate bags shall be disposed of daily in a safe manner.

(*g*) No welding shall be permitted or open flames used in or around the mixing or storage area of the plant unless the equipment or area has been completely washed down and all oxidizer material removed.

(*h*) Before welding or repairs to hollow shafts, all oxidizer material shall be removed from the outside and inside of the shaft and the shaft vented with a minimum one-half inch diameter opening.

(*i*) Explosives shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

(3) *Bulk delivery and mixing vehicles.* (i) The provisions of this subparagraph shall apply to off-highway private operations as well as to all public highway movements.

(ii) A bulk vehicle body for delivering and mixing blasting agents shall conform with the requirements of this subdivision (ii).

(*a*) The body shall be constructed of noncombustible materials.

(*b*) Vehicles used to transport bulk premixed blasting agents on public highways shall have closed bodies.

(*c*) All moving parts of the mixing system shall be designed as to prevent a heat buildup. Shafts or axles which contact the product shall have outboard bearings with 1-inch minimum clearance between the bearings and the outside of the product container. Particular attention shall be given to the clearances on all moving parts.

(*d*) A bulk delivery vehicle shall be strong enough to carry the load without difficulty and be in good mechanical condition.

(iii) Operation of bulk delivery vehicles shall conform to the requirements of this subdivision. These include the placarding requirements as specified by Department of Transportation.

(*a*) The operator shall be trained in the safe operation of the vehicle together with its mixing, conveying, and related equipment. The employer shall assure that the operator is familiar with the commodities being delivered and the general procedure for handling emergency situations.

(*b*) The hauling of either blasting caps or other explosives but not both, shall be permitted on bulk trucks provided that a special wood or nonferrous-lined container is installed for the explosives. Such blasting caps or other explosives shall be in DOT-specified shipping containers: see 49 CFR Chapter I.

(*c*) No person shall smoke, carry matches or any flame-producing device, or carry any firearms while in or about bulk vehicles effecting the mixing transfer or down-the-hole loading of blasting agents at or near the blasting site.

(*d*) Caution shall be exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle over or dragging hoses over firing lines, cap wires, or explosive materials. The employer shall assure that the driver, in moving the vehicle, has assistance of a second person to guide his movements.

(*e*) No intransit mixing of materials shall be performed.

(iv) Pneumatic loading from bulk delivery vehicles into blastholes primed with electric blasting caps or other static-sensitive systems shall conform to the requirements of this subdivision.

(*a*) A positive grounding device shall be used to prevent the accumulation of static electricity.

(*b*) A discharge hose shall be used that has a resistance range that will prevent conducting stray currents, but that is conductive enough to bleed off static buildup.

(*c*) A qualified person shall evaluate all systems to determine if they will adequately dissipate static under potential field conditions.

(v) Repairs to bulk delivery vehicles shall conform to the requirements of this section.

(*a*) No welding or open flames shall be used on or around any part of the delivery equipment unless it has been completely washed down and all oxidizer material removed.

(*b*) Before welding or making repairs to hollow shafts, the shaft shall be thoroughly cleaned inside and out and vented with a minimum one-half-inch diameter opening.

(4) *Bulk storage bins.* (i) The bin, including supports, shall be constructed of compatible materials, waterproof, and adequately supported and braced to withstand the combination of all loads including impact forces arising from product movement within the bin and accidental vehicle contact with the support legs.

(ii) The bin discharge gate shall be designed to provide a closure tight enough to prevent leakage of the stored product. Provision shall also be made so that the gate can be locked.

(iii) Bin loading manways or access hatches shall be hinged or otherwise attached to the bin and be designed to permit locking.

(iv) Any electrically driven conveyors for loading or unloading bins shall conform to the requirements of Subpart S of this Part. They shall be designed to minimize damage from corrosion.

(v) Bins containing blasting agent shall be located, with respect to inhabited buildings, passenger railroads, and public highways, in accordance with Table H-21 and separation from other blasting agent storage and explosives storage shall be in conformity with Table H-22.

(vi) Bins containing ammonium nitrate shall be separated from blasting agent storage and explosives storage in conformity with Table H-22.

TABLE H-22—TABLE OF RECOMMENDED SEPARATION DISTANCES OF AMMONIUM NITRATE AND BLASTING AGENTS FROM EXPLOSIVES OR BLASTING AGENTS [1,6]

Donor weight		Minimum separation distance of receptor when barricaded [2] (ft.)		Minimum thickness of artificial barricades [5] (in.)
Pounds over	Pounds not over	Ammonium nitrate [3]	Blasting agent [4]	
	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Notes to Table of Recommended Separation Distances of Ammonium Nitrate and Blasting Agents from Explosives or Blasting Agents:

NOTE 1. These distances apply to the separation of stores only. Table H-21 shall be used in determining separation distances from inhabited buildings, passenger railways, and public highways.

NOTE 2. When the ammonium nitrate and/or blasting agent is not barricaded, the distances shown in the table shall be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor". Where storage is in bullet-resistant magazines recommended for explosives or where the storage is protected by a bullet-resistant wall, distances, and barricade thicknesses in excess of those prescribed in Table H-21 are not required.

NOTE 3. The distances in the table apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer promulgated by the National Plant Food Institute*; and ammonium nitrate failing to pass said test shall be stored at separation distances determined by competent persons. (*Definition and Test Procedures for Ammonium Nitrate Fertilizer, National Plant Food Institute, November 1964.)

NOTE 4. These distances apply to nitrocarbo-nitrates and blasting agents which pass the insensitivity test prescribed in the U.S. Department of Transportation (DOT) regulations.

NOTE 5. Earth, or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the "donor" when the trees are bare of leaves, are also acceptable.

NOTE 6. When the ammonium nitrate must be counted in determining the distances to be maintained from inhabited buildings, passenger railways and public highways, it may be counted at one-half its actual weight because its blast effect is lower.

NOTE 7. Guide to use of table of recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

(a) Sketch location of all potential donor and acceptor materials together with the maximum mass of material to be allowed in that vicinity. (Potential donors are high explosives, blasting agents, and combination of masses of detonating materials. Potential acceptors are high explosives, blasting agents, and ammonium nitrate.)

(b) Consider separately each donor mass in combination with each acceptor mass. If the masses are closer than table allowance (distances measured between nearest edges), the combination of masses becomes a new potential donor of weight equal to the total mass. When individual masses are considered as donors, distances to potential acceptors shall be measured between edges. When combined masses within propagating distance of each other are considered as a donor, the appropriate distance to the edge of potential acceptors shall be computed as a weighted distance from the combined masses.

Calculation of weighted distance from combined masses:

Let M_2, M_3 . . . M_n be donor masses to be combined.

M_1 is a potential acceptor mass.

D_{12} is distance from M_1 to M_2 (edge to edge).

D_{13} is distance from M_1 to M_3 (edge to edge), etc.

To find weighted distance [$D_1(_{2,3}\ldots{}_n)$] from combined masses to M_1, add the products of the individual masses and distances and divide the total by the sum of the masses thus:

$$D_1(_{2,3,\ldots n})=\frac{M_2\times D_{12}+M_3\times D_{13}\ldots+M_n\times D_{1n}}{M_2+M_3\ldots+M_n}$$

Propagation is possible if either an individual donor mass is less than the tabulated distance from an acceptor or a combined mass is less than the weighted distance from an acceptor.

(c) In determining the distances separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-21), the sum of all masses which may propagate (i.e., lie at distances less than prescribed in the Table) from *either* individual *or* combined donor masses are included. However, when the ammonium nitrate must be included, only 50 percent of its weight shall be used because of its reduced blast effects. In applying Table H-21 to distances from highways, railroads, and inhabited buildings, distances are measured from the nearest edge of potentially explodable material as prescribed in Table H-21, Note 5.

(d) When all or part of a potential acceptor comprises Explosives Class A as defined in DOT regulations, storage in bullet-resistant magazines is required. Safe distances to stores in bullet-resistant magazines may be obtained from the intermagazine distances prescribed in Table H-21.

(e) Barricades must not have line-of-sight openings between potential donors and acceptors which permit blast or missiles to move directly between masses.

(f) Good housekeeping practices shall be maintained around any bin containing ammonium nitrate or blasting agent. This includes keeping weeds and other combustible materials cleared within 25 feet of such bin. Accumulation of spilled product on the ground shall be prevented.

(5) *Storage of blasting agents and supplies.* (i) Blasting agents and oxidizers used for mixing of blasting agents shall be stored in the manner set forth in this subdivision.

(*a*) Blasting agents or ammonium nitrate, when stored in conjunction with explosives, shall be stored in the manner set forth in paragraph (c) of this section for explosives. The mass of blasting agents and one-half the mass of ammonium nitrate shall be included when computing the total quantity of explosives for determining distance requirements.

(*b*) Blasting agents, when stored entirely separate from explosives, may be stored in the manner set forth in paragraph (c) of this section or in one-story warehouses (without basements) which shall be:

(*1*) Noncombustible or fire resistive;

(*2*) Constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire;

(*3*) Weather resistant;

(*4*) Well ventilated; and

(*5*) Equipped with a strong door kept securely locked except when open for business.

(*c*) Semitrailer or full-trailer vans used for highway or onsite transportation of the blasting agents are satisfactory for temporarily storing these materials, provided they are located in accordance with Table H-21 with respect to inhabited buildings, passenger railways, and public highways and according to Table H-22 with respect to one another. Trailers shall be provided with substantial means for locking, and the trailer doors shall be kept locked, except during the time of placement and removal of stocks of blasting agents.

(ii) Warehouses used for the storage of blasting agents separate from explosives shall be located as set forth in this subdivision.

(*a*) Warehouses used for the storage of blasting agents shall be located in accordance with the provisions of Table H-21 with respect to inhabited buildings, passenger railways, and public highways, and according to Table H-22 with respect to one another.

(*b*) If both blasting agents and ammonium nitrate are handled or stored within the distance limitations prescribed through subparagraph (2) of this paragraph, one-half the mass of the ammonium nitrate shall be added to the mass of the blasting agent when computing the total quantity of explosives for determining the proper distance for compliance with Table H-21.

(iii) Smoking, matches, open flames, spark producing devices, and firearms are prohibited inside of or within 50 feet of any warehouse used for the storage of blasting agents. Combustible materials shall not be stored within 50 feet of warehouses used for the storage of blasting agents.

(iv) The interior of warehouses used for the storage of blasting agents shall be kept clean and free from debris and empty containers. Spilled materials shall be cleaned up promptly and safely removed. Combustible materials, flammable liquids, corrosive acids, chlorates, or nitrates shall not be stored in any warehouse used for blasting agents unless separated therefrom by a fire resistive separation of not less than 1 hour resistance. The provisions of this subdivision shall not prohibit the storage of blasting agents together with nonexplosive blasting supplies.

(v) Piles of ammonium nitrate and warehouses containing ammonium nitrate shall be adequately separated from readily combustible fuels.

(vi) Caked oxidizers, either in bags or in bulk, shall not be loosened by blasting.

(vii) Every warehouse used for the storage of blasting agents shall be under the supervision of a competent person who shall be not less than 21 years of age.

(6) *Transportation of packaged blasting agents.* (i) When blasting agents are transported in the same vehicle with explosives, all of the requirements of paragraph (d) of this section shall be complied with.

(ii) Vehicles transporting blasting agents shall only be driven by and be in charge of a driver at least twenty-one (21) years of age who is capable, careful, reliable, and in possession of a valid motor vehicle operator's license. Such a person shall also be familiar with the States vehicle and traffic laws.

(iii) No matches, firearms, acids, or other corrosive liquids shall be carried in the bed or body of any vehicle containing blasting agents.

(iv) No person shall be permitted to ride upon, drive, load, or unload a vehicle containing blasting agents while smoking or under the influence of intoxicants, narcotics, or other dangerous drugs.

(v) It is prohibited for any person to transport or carry any blasting agents upon any public vehicle carrying passengers for hire.

(vi) Vehicles transporting blasting agents shall be in safe operating condition at all times.

(vii) When offering blasting agents for transportation on public highways the packaging, marking, and labeling of containers of blasting agents shall comply with the requirements of DOT.

(viii) Vehicles used for transporting blasting agents on public highways shall be placarded in accordance with DOT regulations.

(7) *Use of blasting agents.* Persons using blasting agents shall comply with all of the applicable provisions of paragraph (e) of this section.

(h) *Water gel (Slurry) explosives and blasting agents*—(1) *General provisions.* Unless otherwise set forth in this paragraph, water gels shall be transported, stored and used in the same manner as explosives or blasting agents in accordance with the classification of the product.

(2) *Types and classifications.* (i) Water gels containing a substance in itself classified as an explosive shall be classified as an explosive and manufactured, transported, stored, and used as specified for "explosives" in this section, except as noted in subdivision (iv) of this subparagraph.

(ii) Water gels containing no substance in itself classified as an explosive and which are cap-sensitive as defined in paragraph (a) of this section under Blasting Agent shall be classified as an explosive and manufactured, transported, stored and used as specified for "explosives" in this section.

(iii) Water gels containing no substance in itself classified as an explosive and which are not cap-sensitive as defined in paragraph (a) of this section under Blasting Agent shall be classified as blasting agents and manufactured, transported, stored, and used as specified for "blasting agents" in this section.

(iv) When tests on specific formulations of water gels result in Department of Transportation classification as a Class B explosive, bullet-resistant magazines are not required, see paragraph (c)(2)(ii) of this section.

(3) *Fixed location mixing.* (i)(*a*) Buildings or other facilities used for mixing water gels shall be located with respect to inhabited buildings, passenger railroads and public highways, in accordance with Table H–21.

(*b*) In determining the distances separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H–21), the sum of all masses that may propagate (i.e., lie at distances less than prescribed in Table H–22) from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only 50 percent of its weight shall be used because of its reduced blast effects.

(ii) Buildings used for the mixing of water gels shall conform to the requirements of this subdivision.

(*a*) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(*b*) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(*c*) Where fuel oil is used all fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(*d*) The building shall be well ventilated.

(*e*) Heating units that do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside of the mixing building.

(*f*) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a firewall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(iii) Ingredients of water gels shall conform to the requirements of this subdivision.

(*a*) Ingredients in themselves classified as Class A or Class B explosives shall be stored in conformity with paragraph (c) of this section.

(*b*) Nitrate-water solutions may be stored in tank cars, tank trucks, or fixed tanks without quantity or distance limitations. Spills or leaks which may contaminate combustible materials shall be cleaned up immediately.

(*c*) Metal powders such as aluminum shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weathertight. Solid fuels shall be used in such manner as to minimize dust explosion hazards.

(*d*) Ingredients shall not be stored with imcompatible materials.

(*e*) Peroxides and chlorates shall not be used.

(iv) Mixing equipment shall comply with the requirements of this subdivision.

(*a*) The design of the processing equipment, including mixing and conveying equipment, shall be compatible with the relative sensitivity of the materials being handled. Equipment shall be designed to minimize the possibility of frictional heating, compaction, overloading, and confinement.

(*b*) Both equipment and handling procedures shall be designed to prevent the introduction of foreign objects or materials.

(*c*) Mixers, pumps, valves, and related equipment shall be designed to permit regular and periodic flushing, cleaning, dismantling, and inspection.

(*d*) All electrical equipment including wiring, switches, controls, motors, and lights, shall conform to the requirements of Subpart S of this part.

(*e*) All electric motors and generators shall be provided with suitable overload protection devices. Electrical generators, motors, proportioning devices, and all other electrical enclosures shall be electrically bonded. The grounding conductor to all such electrical equipment shall be effectively bonded to the service-entrance ground connection and to all equipment ground connections in a manner so as to provide a continuous path to ground.

(v) Mixing facilities shall comply with the fire prevention requirements of this subdivision.

(*a*) The mixing, loading, and ingredient transfer areas where residues or spilled materials may accumulate shall be cleaned periodically. A cleaning and collection system for dangerous residues shall be provided.

(*b*) A daily visual inspection shall be made of mixing, conveying, and electrical equipment to establish that such equipment is in good operating condition. A program of systematic maintenance shall be conducted on regular schedule.

(*c*) Heaters which are not dependent on the combustion process within the heating unit may be used within the confines of processing buildings, or compartments, if provided with temperature and safety controls and located away from combustible materials and the finished product.

(4) *Bulk delivery and mixing vehicles.* (i) The design of vehicles shall comply with the requirements of this subdivision.

(*a*) Vehicles used over public highways for the bulk transportation of water gels or of ingredients classified as dangerous commodities, shall meet the requirements of th Department of Transportation and shall meet the requirements of paragraphs (d) and (g)(6) of this section.

(*b*) When electric power is supplied by a self-contained motor generator located on the vehicle the generator shall be at a point separate from where the water gel is discharged.

(*c*) The design of processing equipment and general requirements shall conform to subparagraphs (3) (iii) and (iv) of this paragraph.

(*d*) A positive action parking brake which will set the wheel brakes on at least one axle shall be provided on vehicles when equipped with air brakes and shall be used during bulk delivery operations. Wheel chocks shall supplement parking brakes whenever conditions may require.

(ii) Operation of bulk delivery and mixing vehicles shall comply with the requirements of this subdivision.

(*a*) The placarding requirements contained in DOT regulations apply to vehicles carrying water gel explosives or blasting agents.

(*b*) The operator shall be trained in the safe operation of the vehicle together with its mixing, conveying, and related equipment. He shall be familiar with the commodities being delivered and the general procedure for handling emergency situations.

(*c*) The hauling of either blasting caps or other explosives, but not both, shall be permitted on bulk trucks provided that a special wood or nonferrous-lined container is installed for the explosives. Such blasting caps or other explosives shall be in DOT-specified shipping containers; see 49 CFR Chapter I.

(*d*) No person shall be allowed to smoke, carry matches or any flame-producing device, or carry any firearms while in or about bulk vehicles effecting the mixing, transfer, or down-the-hole loading of water gels at or near the blasting site.

(*e*) Caution shall be exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle over or dragging hoses over firing lines, cap wires, or explosive materials. The employer shall furnish the driver the assistance of a second person to guide the driver's movements.

(*f*) No intransit mixing of materials shall be performed.

(*g*) The location chosen for water gel or ingredient transfer from a support vehicle into the borehole loading vehicle shall be away from the blasthole site when the boreholes are loaded or in the process of being loaded.

(i) *Storage of ammonium nitrate*—(1) *Scope and definitions.* (i)(*a*) Except as provided in subdivision (*d*) of this subdivision this paragraph applies to the storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more ammonium nitrate by weight but does not apply to blasting agents.

(*b*) This paragraph does not apply to the transportation of ammonium nitrate.

(*c*) This paragraph does not apply to storage under the jurisdiction of and in compliance with the regulations of the U.S. Coast Guard (see 46 CFR Parts 146–149).

(*d*) The storage of ammonium nitrate and ammonium nitrate mixtures that are more sensitive than allowed by the "Definition of Test Procedures for Ammonium Nitrate Fertilizer" is prohibited.

(*e*) Nothing in this paragraph shall apply to the production of ammonium nitrate or to the storage of ammonium nitrate on the premises of the producing plant, provided that no distinct undue hazard to the public is created.

(ii) (*a*) The definition and test procedures for ammonium nitrate fertilizer are those found in the bulletin, "Definition and Test Procedures for Ammonium Nitrate Fertilizer", available from the National Plant Food Institute, 1700 K Street NW., Washington, DC 20006. This definition limits the contents of organic materials, metals, sulfur, etc., in a product that may be classified ammonium nitrate fertilizer.

(*b*) The standards for ammonium nitrate (nitrous oxide grade) are those found in the "Specifications, Properties, and Recommendations for Packaging, Transportation, Storage, and Use of Ammonium Nitrate", available from the Compressed Gas Association, Inc., 500 Fifth Avenue, New York, NY 10036.

(2) *General provisions.* (i) This paragraph applies to all persons storing, having, or keeping ammonium nitrate, and to the owner or lessee of any building, premises, or structure in which ammonium nitrate is stored in quantities of 1,000 pounds or more.

(ii) Approval of large quantity storage shall be subject to due consideration of the fire and explosion hazards, including exposure to toxic vapors from burning or decomposing ammonium nitrate.

(iii) (*a*) Storage buildings shall not have basements unless the basements are open on at least one side. Storage buildings shall not be over one story in height.

(*b*) Storage buildings shall have adequate ventilation or be of a construction that will be self-ventilating in the event of fire.

(*c*) The wall on the exposed side of a storage building within 50 feet of a combustible building, forest, piles of combustible materials and similar exposure hazards shall be of fire-resistive construction. In lieu of the fire-resistive wall, other suitable means of exposure protection such as a free standing wall may be used. The roof coverings shall be Class C or better, as defined in the manual on Roof Coverings, NFPA 203M-1970.

(*d*) All flooring in storage and handling areas, shall be of noncombustible material or protected against impregnation by ammonium nitrate and shall be without open drains, traps, tunnels, pits, or pockets into which any molten ammonium nitrate could flow and be confined in the event of fire.

(*e*) The continued use of an existing storage building or structure not in strict conformity with this paragraph may be approved in cases where such continued use will not constitute a hazard to life or adjoining property.

(*f*) Buildings and structures shall be dry and free from water seepage through the roof, walls, and floors.

(3) *Storage of ammonium nitrate in bags, drums, or other containers.* (i) (*a*) Bags and containers used for ammonium nitrate must comply with specifications and standards required for use in interstate commerce (see 49 CFR Chapter I).

(*b*) Containers used on the premises in the actual manufacturing or processing need not comply with provisions of subdivision (*a*) of this subdivision.

(ii) (*a*) Containers of ammonium nitrate shall not be accepted for storage when the temperature of the ammonium nitrate exceeds 130° F.

(*b*) Bags of ammonium nitrate shall not be stored within 30 inches of the storage building walls and partitions.

(*c*) The height of piles shall not exceed 20 feet. The width of piles shall not exceed 20 feet and the length 50 feet except that where the building is of noncombustible construction or is protected by automatic sprinklers the length of piles shall not be limited. In no case shall the ammonium nitrate be stacked closer than 36 inches below the roof or supporting and spreader beams overhead.

(*d*) Aisles shall be provided to separate piles by a clear space of not less than 3 feet in width. At least one service or main aisle in the storage area shall be not less than 4 feet in width.

(4) *Storage of bulk ammonium nitrate.* (i) (*a*) Warehouses shall have adequate ventilation or be capable of adequate ventilation in case of fire.

(*b*) Unless constructed of noncombustible material or unless adequate facilities for fighting a roof fire are available, bulk storage structures shall not exceed a height of 40 feet.

(ii) (*a*) Bins shall be clean and free of materials which may contaminate ammonium nitrate.

(*b*) Due to the corrosive and reactive properties of ammonium nitrate, and to avoid contamination, galvanized iron, copper, lead, and zinc shall not be used in a bin construction unless suitably protected. Aluminum bins and wooden bins protected against impregnation by ammonium nitrate are permissible. The partitions dividing the ammonium nitrate storage from other products which would contaminate the ammonium nitrate shall be of tight construction.

(*c*) The ammonium nitrate storage bins or piles shall be clearly identified by signs reading "Ammonium Nitrate" with letters at least 2 inches high.

(iii) (*a*) Piles or bins shall be so sized and arranged that all material in the pile is moved out periodically in order to minimize possible caking of the stored ammonium nitrate.

(*b*) Height or depth of piles shall be limited by the pressure-setting tendency of the product. However, in no case shall the ammonium nitrate be piled higher at any point than 36 inches below the roof or supporting and spreader beams overhead.

(*c*) Ammonium nitrate shall not be accepted for storage when the temperature of the product exceeds 130° F.

(*d*) Dynamite, other explosives, and blasting agents shall not be used to break up or loosen caked ammonium nitrate.

(5) *Contaminants.* (i) (*a*) Ammonium nitrate shall be in a separate building or shall be separated by approved type firewalls of not less than 1 hour fire-resistance rating from storage of organic chemicals, acids, or other corrosive materials, materials that may require blasting during processing or handling, compressed flammable gases, flammable and combustible materials or other contaminating substances, including but not limited to animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap or cotton bags, caustic soda, coal, coke, charcoal, cork, camphor, excelsior, fibers of any kind, fish oils, fish meal, foam rubber, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, oakum, oiled clothing, oiled paper, oiled textiles, paint, straw, sawdust, wood shavings, or vegetable oils. Walls referred to in this subdivision need extend only to the underside of the roof.

(*b*) In lieu of separation walls, ammonium nitrate may be separated from the materials referred to in subdivision (*a*) of this subdivision by a space of at least 30 feet.

(*c*) Flammable liquids such as gasoline, kerosene, solvents, and light fuel oils shall not be stored on the premises except when such storage conforms to § 1910.106, and when walls and sills or curbs are provided in accordance with subdivisions (*a*) or (*b*) of this subdivision.

(*d*) LP-Gas shall not be stored on the premises except when such storage conforms to § 1910.110.

(ii) (*a*) Sulfur and finely divided metals shall not be stored in the same building with ammonium nitrate except when such storage conforms to paragraphs (a) through (h) of this section.

(*b*) Explosives and blasting agents shall not be stored in the same building with ammonium nitrate except on the premises of makers, distributors, and user-compounders of explosives or blasting agents.

(*c*) Where explosives or blasting agents are stored in separate buildings, other than on the premises of makers, distributors, and user-compounders of explosives or blasting agents, they shall be separated from the ammonium nitrate by the distances and/or barricades specified in Table H-22 of this subpart, but by not less than 50 feet.

(*d*) Storage and/or operations on the premises of makers, distributors, and user-compounders of explosives or blasting agents shall be in conformity with paragraphs (a) through (h) of this section.

(6) *General precautions.* (i) (*a*) Electrical installations shall conform to the requirements of subpart S of this part, for ordinary locations. They shall be designed to minimize damage from corrosion.

(vi) In areas where lightning storms are prevalent, lightning protection shall be provided. (See the Lightning Protection Code, NFPA 78-1968.)

(vii) Provisions shall be made to prevent unauthorized personnel from entering the ammonium nitrate storage area.

(7) *Fire protection.* (i) Not more than 2,500 tons of bagged ammonium nitrate shall be stored in a building or structure not equipped with an automatic sprinkler system. Sprinkler systems shall be of approved type and installed in accordance with the Standard for the Installation of Sprinkler Systems, NFPA 13-1969.

(ii) (*a*) Suitable fire control devices such as small hose or portable extinguishers shall be provided throughout the warehouse and in the loading and unloading areas. See the Standard for the Installation of Portable Fire Extinguishers, NFPA 10-1970, and the Standard for the Installation of Standpipe and Hose Systems, NFPA 14-1970.

(*b*) Water supplies and fire hydrants shall be available in accordance with recognized good practices.

(j) *Small arms ammunition, small arms primers, and small arms propellants*—(1) *Scope.* This paragraph does not apply to in-process storage and intraplant transportation during manufacture of small arms ammunition, small arms primers, and smokeless propellants.

(2) *Small arms ammunition.* (i) No quantity limitations are imposed on the storage of small arms ammunition in warehouses, retail stores, and other general occupancy facilities, except those imposed by limitations of storage facilities.

(ii) Small arms ammunition shall be separated from flammable liquids, flammable solids as classified in 49 CFR Part 172, and from oxidizing materials, by a fire-resistive wall of 1-hour rating or by a distance of 25 feet.

(iii) Small arms ammunition shall not be stored together with Class A or Class B explosives unless the storage facility is adequate for this latter storage.

(3) *Smokeless propellants.* (i) All smokeless propellants shall be stored in shipping containers specified in 49 CFR 173.93 for smokeless propellants.

(ii) Not more than 20 pounds of smokeless propellants, in containers of 1 pound maximum capacity, shall be displayed in commercial establishments.

(iii) Commercial stocks of smokeless propellants over 20 pounds and not more than 100 pounds shall be stored in portable wooden boxes having walls of at least 1 inch nominal thickness.

(iv) Commercial stocks in quantities not to exceed 750 pounds shall be stored in nonportable storage cabinets having wooden walls of at least 1 inch nominal thickness. Not more than 400 pounds shall be permitted in any one cabinet.

(v) Quantities in excess of 750 pounds shall be stored in magazines in accordance with paragraph (c) of this section.

(4) *Small arms ammunition primers.* (i) Small arms ammunition primers shall not be stored except in the original shipping container in accordance with the requirements of 49 CFR 173.107 for small arms ammunition primers.

(ii) Not more than 10,000 small arms ammunition primers may be displayed in commercial establishments.

(iii) Small arms ammunition primers shall be separated from flammable liquids, flammable solids as classified in 49 CFR Part 172, and oxidizing materials by a fire-resistive wall of 1-hour rating or by a distance of 25 feet.

(iv) Not more than 750,000 small arms ammunition primers shall be stored in any one building, except as provided in subdivision (v) of this subparagraph. Not more than 100,000 shall be stored in any one pile. Piles shall be at least 15 feet apart.

(v) Quantities of small arms ammunition primers in excess of 750,000 shall be stored in magazines in accordance with paragraph (c) of this section.

(k) *Scope.* This section applies to the manufacture, keeping, having, storage, sale, transportation, and use of explosives, blasting agents, and pyrotechnics. This section does not apply to the sale and use (public display) of pyrotechnics, commonly known as fireworks, nor to the use of explosives in the form prescribed by the official U.S. Pharmacopeia.

§ 1910.110 Storage and handling of liquefied petroleum gases.

(a) *Definitions applicable to this section.* As used in this section:

(1) API-ASME container—A container constructed in accordance with the requirements of paragraph (b)(3)(iii) of this section.

(2) ASME container — A container constructed in accordance with the requirements of paragraph (b)(3)(i) of this section.

(3) Container assembly—An assembly consisting essentially of the container and fittings for all container openings, including shutoff valves, excess flow valves, liquid-level gaging devices, safety relief devices, and protective housing.

(4) Containers—All vessels, such as tanks, cylinders, or drums, used for transportation or storing liquefied petroleum gases.

(5) DOT — Department of Transportation.

(6) DOT container—A container constructed in accordance with the applicable requirements of 49 CFR Chapter 1.

(7) "Liquified petroleum gases"—"LPG" and "LP-Gas"—Any material which is composed predominantly of any of the following hydrocarbons, or mixtures of them; propane, propylene, bu-

tanes (normal butane or iso-butane), and butylenes.

(8) Movable fuel storage tenders or farm carts—Containers not in excess of 1,200 gallons water capacity, equipped with wheels to be towed from one location of usage to another. They are basically nonhighway vehicles, but may occasionally be moved over public roads or highways. They are used as a fuel supply for farm tractors, construction machinery and similar equipment.

(9) P.S.I.G.—pounds per square inch gauge.

(10) P.S.I.A.—pounds per square inch absolute.

(11) Systems—an assembly of equipment consisting essentially of the container or containers, major devices such as vaporizers, safety relief valves, excess flow valves, regulators, and piping connecting such parts.

(12) Vaporizer-burner—an integral vaporizer-burner unit, dependent upon the heat generated by the burner as the source of heat to vaporize the liquid used for dehydrators or dryers.

(13) Ventilation, adequate—when specified for the prevention of fire during normal operation, ventilation shall be considered adequate when the concentration of the gas in a gas-air mixture does not exceed 25 percent of the lower flammable limit.

(14) Approved—unless otherwise indicated, listing or approval by the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factual Mutual Engineering Corp.

(15) Listed—see "approved" in § 1910.110(14).

(16) DOT Specifications—regulations of the Department of Transportation published in 49 CFR Chapter I.

(17) DOT regulations—see § 1910.110(a)(16).

(18) DOT requirements—see § 1910.110(a)(16).

(19) DOT cylinders—cylinders meeting the requirements of 49 CFR Chapter I.

(b) *Basic rules.*—(1) *Odorizing gases.* (i) All liquefied petroleum gases shall be effectively odorized by an approved agent of such character as to indicate positively, by distinct odor, the presence of gas down to concentration in air of not over one-fifth the lower limit of flammability. Odorization, however, is not required if harmful in the use of further processing of the liquefied petroleum gas, or if odorization will serve no useful purpose as a warning agent in such use or further processing.

(ii) The odorization requirement of subdivision (i) of this subparagraph shall be considered to be met by the use of 1.0 pounds of ethyl mercaptan, 1.0 pounds of thiophane or 1.4 pounds of amyl mercaptan per 10,000 gallons of LP-Gas. However, this listing of odorants and quantities shall not exclude the use of other odorants that meet the odorization requirements of subdivision (i) of this subparagraph.

(2) *Approval of equipment and systems.* (i) Each system utilizing DOT containers in accordance with 49 CFR Part 178 shall have its container valves, connectors, manifold valve assemblies, and regulators approved.

(ii) Each system for domestic or commercial use utilizing containers of 2,000 gallons or less water capacity, other than those constructed in accordance with 49 CFR Part 178, shall consist of a container assembly and one or more regulators, and may include other parts. The system as a unit or the container assembly as a unit, and the regulator or regulators, shall be individually listed.

(iii) In systems utilizing containers of over 2,000 gallons water capacity, each regulator, container valve, excess flow valve, gaging device, and relief valve installed on or at the container, shall have its correctness as to design, construction, and performance determined by listing by Underwriters Laboratories, Inc., or Factory Mutual Engineering Corp.

(3) *Requirements for construction and original test of containers.* (i) Containers used with systems embodied in paragraphs (d), (e), (g), and (h) of this section, except as provided in paragraphs (e)(3)(iii) and (g)(2)(i) of this section, shall be designed, constructed, and tested in accordance with the Rules for Construction of Unfired Pressure Vessels, section VIII, Division 1, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1968 edition.

(ii) Containers constructed according to the 1949 and earlier editions of the ASME Code do not have to comply with paragraphs U–2 through U–10 and U–19 thereof. Containers constructed according to paragraph U–70 in the 1949 and earlier editions are not authorized.

(iii) Containers designed, constructed, and tested prior to July 1, 1961, according to the Code for Unfired Pressure Vessels for Petroleum Liquids and Gases, 1951 edition with 1954 Addenda, of the American Petroleum Institute and the American Society of Mechanical Engineers shall be considered in conformance. Containers constructed according to API–ASME Code do not have to comply with section I or with appendix to section I. Paragraphs W–601 to W–606 inclusive in the 1943 and earlier editions do not apply.

(iv) The provisions of subdivision (i) of this subparagraph shall not be construed as prohibiting the continued use or reinstallation of containers constructed and maintained in accordance with the standard for the Storage and Handling of Liquefied Petroleum Gases NFPA No. 58 in effect at the time of fabrication.

(v) Containers used with systems embodied in paragraph (b), (d)(3)(iii), and (f) of this section, shall be constructed, tested, and stamped in accordance with DOT specifications effective at the date of their manufacture.

(4) *Welding of containers.* (i) Welding to the shell, head, or any other part of the container subject to internal pressure, shall be done in compliance with the code under which the tank was fabricated. Other welding is permitted only on saddle plates, lugs, or brackets attached to the container by the tank manufacturer.

(ii) Where repair or modification involving welding of DOT containers is required, the container shall be returned to a qualified manufacturer making containers of the same type, and the repair or modification made in compliance with DOT regulations.

(5) *Markings on containers.* (i) Each container covered in subparagraph (3)(i) of this paragraph, except as provided in subparagraph (3)(iv) of this paragraph shall be marked as specified in the following:

(*a*) With a marking identifying compliance with, and other markings required by, the rules of the reference under which the container is constructed; or with the stamp and other markings required by the National Board of Boiler and Pressure Vessel Inspectors.

(*b*) With notation as to whether the container is designed for underground or aboveground installation or both. If intended for both and different style hoods are provided, the marking shall indicate the proper hood for each type of installation.

(*c*) With the name and address of the supplier of the container, or with the trade name of the container.

(*d*) With the water capacity of the container in pounds or gallons, U.S. Standard.

(*e*) With the pressure in p.s.i.g., for which the container is designed.

(*f*) With the wording "This container shall not contain a product having a vapor pressure in excess of — p.s.i.g. at 100° F.," see subparagraph (14)(viii) of this paragraph.

(*g*) With the tare weight in pounds or other identified unit of weight for containers with a water capacity of 300 pounds or less.

(*h*) With marking indicating the maximum level to which the container may be filled with liquid at temperatures between 20° F. and 130° F., except on containers provided with fixed maximum level indicators or which are filled by weighing. Markings shall be increments of not more than 20° F. This marking may be located on the liquid level gaging device.

(*i*) With the outside surface area in square feet.

(ii) Markings specified shall be on a metal nameplate attached to the container and located in such a manner as to remain visible after the container is installed.

(iii) When LP-Gas and one or more other gases are stored or used in the same area, the containers shall be marked to identify their content. Marking shall be in compliance with American National Standard Z48.1–1954, "Method of Marking Portable Compressed Gas Containers To Identify the Material Contained."

(6) *Location of containers and regulating equipment.* (i) Containers, and first stage regulating equipment if used, shall be located outside of buildings, except under one or more of the following:

(*a*) In buildings used exclusively for container charging, vaporization pressure reduction, gas mixing, gas manufacturing, or distribution.

(*b*) When portable use is necessary and in accordance with paragraph (c)(5) of this section.

(*c*) LP-Gas fueled stationary or portable engines in accordance with paragraph (e)(11) or (12) of this section.

(*d*) LP-Gas fueled industrial trucks used in accordance with paragraph (e)(13) of this section.

(*e*) LP-Gas fueled vehicles garaged in accordance with paragraph (e)(14) of this section.

(*f*) Containers awaiting use or resale when stored in accordance with paragraph (f) of this section.

(ii) Each individual container shall be located with respect to the nearest important building or group of buildings or line of adjoining property which may be built on in accordance with Table H-23.

TABLE H-23

Water capacity per container	Minimum distances		
	Containers		Between above-ground containers
	Underground	Aboveground	
Less than 125 gals [1]	10 feet	None	None.
125 to 250 gallons	10 feet	10 feet	None.
251 to 500 gallons	10 feet	10 feet	3 feet.
501 to 2,000 gallons	25 feet [2]	25 feet [2]	3 feet.
2,001 to 30,000 gallons	50 feet	50 feet	5 feet.
30,001 to 70,000 gallons	50 feet	75 feet	¼ of sum of diameters of adjacent containers.
70,001 to 90,000 gallons	50 feet	100 feet	

[1] If the aggregate water capacity of a multi-container installation at a consumer site is 501 gallons or greater, the minimum distance shall comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per container. If more than one installation is made, each installation shall be separated from another installation by at least 25 feet. Do not apply the MINIMUM DISTANCES BETWEEN ABOVEGROUND CONTAINERS to such installations.

[2] NOTE: The above distance requirements may be reduced to not less than 10 feet for a single container of 1,200 gallons water capacity or less, providing such a container is at least 25 feet from any other LP-Gas container of more than 125 gallons water capacity.

(iii) Containers installed for use shall not be stacked one above the other.

(iv) In industrial installations involving containers of 180,000 gallons aggregate water capacity or more, where serious mutual exposures between the container and adjacent properties prevail, firewalls or other means of special protection designed and constructed in accordance with good engineering practices are required.

(v) In the case of buildings devoted exclusively to gas manufacturing and distributing operations, the distances required by Table H-23 may be reduced provided that in no case shall containers of water capacity exceeding 500 gallons be located closer than 10 feet to such gas manufacturing and distributing buildings.

(vi) Readily ignitible material such as weeds and long dry grass shall be removed within 10 feet of any container.

(vii) The minimum separation between liquefied petroleum gas containers and flammable liquid tanks shall be 20 feet, and the minimum separation between a container and the centerline of the dike shall be 10 feet. The foregoing provision shall not apply when LP-Gas containers of 125 gallons or less capacity are installed adjacent to Class III flammable liquid tanks of 275 gallons or less capacity.

(viii) Suitable means shall be taken to prevent the accumulation of flammable liquids under adjacent liquefied petroleum gas containers, such as by diking, diversion curbs, or grading.

(ix) When dikes are used with flammable liquid tanks, no liquefied petroleum gas containers shall be located within the diked area.

(7) *Container valves and container accessories.* (i) Valves, fittings, and accessories connected directly to the container including primary shutoff valves, shall have a rated working pressure of at least 250 p.s.i.g. and shall be of material and design suitable for LP-Gas service. Cast iron shall not be used for container valves, fittings, and accessories. This does not prohibit the use of container valves made of malleable or nodular iron.

(ii) Connections to containers, except safety relief connections, liquid level gaging devices, and plugged openings, shall have shutoff valves located as close to the container as practicable.

(iii) Excess flow valves, where required shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer. The connections or line including valves, fittings, etc., being protected by an excess flow valve shall have a greater capacity than the rated flow of the excess flow valve.

(iv) Liquid level gaging devices which are so constructed that outward flow of container contents shall not exceed that passed by a No. 54 drill size opening, need not be equipped with excess flow valves.

(v) Openings from container or through fittings attached directly on container to which pressure gage connection is made, need not be equipped with shutoff or excess flow valves if such openings are restricted to not larger than No. 54 drill size opening.

(vi) Except as provided in paragraph (c)(5)(i)(*b*) of this section, excess flow and back pressure check valves where required by this section shall be located inside of the container or at a point outside where the line enters the container; in the latter case, installation shall be made in such manner that any undue strain beyond the excess flow or back pressure check valve will not cause breakage between the container and such valve.

(vii) Excess flow valves shall be designed with a bypass, not to exceed a No. 60 drill size opening to allow equalization of pressures.

(viii) Containers of more than 30 gallons water capacity and less than 2,000 gallons water capacity, filled on a volumetric basis, and manufactured after December 1, 1963, shall be equipped for filling into the vapor space.

(8) *Piping—including pipe, tubing, and fittings.* (i) Pipe, except as provided in paragraphs (e)(6)(i) and (g)(10)(iii), of this section shall be wrought iron or steel (black or galvanized), brass, copper, or aluminum alloy. Aluminum alloy pipe shall be at least Schedule 40 in accordance with the specifications for Aluminum Alloy Pipe, American National Standards Institute (ANSI) H38.-7-1969 (ASTM, B241-69), except that the use of alloy 5456 is prohibited and shall be suitably marked at each end of each length indicating compliance with American National Standard Institute Specifications. Aluminum Alloy pipe shall be protected against external corrosion when it is in contact with dissimilar metals other than galvanized steel, or its location is subject to repeated wetting by such liquids as water (except rain water), detergents, sewage, or leaking from other piping, or it passes through flooring, plaster, masonry, or insulation. Galvanized sheet steel or pipe, galvanized inside and out, may be considered suitable protection. The maximum nominal pipe size for aluminum pipe shall be three-fourths inch and shall not be used for pressures exceeding 20 p.s.i.g. Aluminum alloy pipe shall not be installed within 6 inches of the ground.

(*a*) Vapor piping with operating pressures not exceeding 125 p.s.i.g. shall be suitable for a working pressure of at least 125 p.s.i.g. Pipe shall be at least Schedule 40 (ASTM A-53-69, Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal).

(*b*) Vapor piping with operating pressures over 125 p.s.i.g. and all liquid piping shall be suitable for a working pressure of at least 250 p.s.i.g. Pipe shall be at least Schedule 80 if joints are threaded or threaded and back welded. At least Schedule 40 (ASTM A-53-69 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal) shall be used if joints are welded, or welded and flanged.

(ii) Tubing shall be seamless and of copper, brass, steel, or aluminum alloy. Copper tubing shall be of type K or L or equivalent as covered in the Specification for Seamless Copper Water Tube, ANSI H23.1-1970 (ASTM B88-69). Aluminum alloy tubing shall be of Type A or B or equivalent as covered in Specification ASTM B210-68 and shall be suitably marked every 18 inches indicating compliance with ASTM Specifications. The minimum nominal wall thickness of copper tubing and aluminum alloy tubing shall be as specified in Table H-24 and Table H-25.

TABLE H-24—WALL THICKNESS OF COPPER TUBING [1]

NOTE: The standard size by which tube is designated is ⅛-inch smaller than its nominal outside diameter.

Standard size (inches)	Nominal O.D. (inches)	Nominal wall thickness (inches)	
		Type K	Type L
¼	0.375	0.035	0.030
⅜	0.500	0.049	0.035
½	0.625	0.049	0.040
⅝	0.750	0.049	0.042
¾	0.875	0.065	0.045
1	1.125	0.065	0.050
1¼	1.375	0.065	0.055
1½	1.625	0.072	0.060
2	2.125	0.083	0.070

[1] Based on data in Specification for Seamless Copper Water Tube, ANSI H23.1-1970 (ASTM B-88-69).

TABLE H-25—WALL THICKNESS OF ALUMINUM ALLOY TUBING [1]

Outside diameter (inches)	Nominal wall thickness (inches)	
	Type A	Type B
⅜	0.035	0.049
½	0.035	0.049
⅝	0.042	0.049
¾	0.049	0.058

[1] Based on data in Standard Specification for Aluminum-Alloy Drawn Seamless Coiled Tubes for Special Purpose Applications, ASTM B210-68.

Aluminum alloy tubing shall be protected against external corrosion when it is in contact with dissimilar metals other than galvanized steel, or its location is subject to repeated wetting by liquids such as water (except rainwater), detergents, sewage, or leakage from other piping, or it passes through flooring, plaster, masonry, or insulation. Galvanized sheet steel or pipe, galvanized inside and out, may be considered suitable protection. The maximum outside diameter for aluminum alloy tubing shall be three-fourths inch and shall not be used for pressures exceeding 20 p.s.i.g. Aluminum alloy tubing shall not be installed within 6 inches of the ground.

(iii) In systems where the gas in liquid form without pressure reduction enters the building, only heavy walled seamless brass or copper tubing with an internal diameter not greater than three thirty-seconds inch, and a wall thickness of not less than three sixty-fourths inch shall be used. This requirement shall not apply to research and experimental laboratories, buildings, or separate fire divisions of buildings used exclusively for housing internal combustion engines, and to commercial gas plants or bulk stations where containers are charged, nor to industrial vaporizer buildings, nor to buildings, structures, or equipment under construction or undergoing major renovation.

(iv) Pipe joints may be screwed, flanged, welded, soldered, or brazed with a material having a melting point exceeding 1,000° F. Joints on seamless copper, brass, steel, or aluminum alloy gas tubing shall be made by means of approved gas tubing fittings, or soldered or brazed with a material having a melting point exceeding 1,000° F.

(v) For operating pressures of 125 p.s.i.g. or less, fittings shall be designed for a pressure of at least 125 p.s.i.g. For operating pressures above 125 p.s.i.g., fittings shall be designed for a minimum of 250 p.s.i.g.

(vi) The use of threaded cast iron pipe fittings such as ells, tees, crosses, couplings, and unions is prohibited. Aluminum alloy fittings shall be used with aluminum alloy pipe and tubing. Insulated fittings shall be used where aluminum alloy pipe or tubing connects with a dissimilar metal.

(vii) Strainers, regulators, meters, compressors, pumps, etc., are not to be considered as pipe fittings. This does not prohibit the use of malleable, nodular, or higher strength gray iron for such equipment.

(viii) All materials such as valve seats, packing, gaskets, diaphragms, etc., shall be of such quality as to be resistant to the action of liquified petroleum gas under the service conditions to which they are subjected.

(ix) All piping, tubing, or hose shall be tested after assembly and proved free from leaks at not less than normal operating pressures. After installation, piping and tubing of all domestic and commercial systems shall be tested and proved free of leaks using a manometer or equivalent device that will indicate a drop in pressure. Test shall not be made with a flame.

(x) Provision shall be made to compensate for expansion, contraction, jarring, and vibration, and for settling. This may be accomplished by flexible connections.

(xi) Piping outside buildings may be buried, above ground, or both, but shall be well supported and protected against physical damage. Where soil conditions warrant, all piping shall be protected against corrosion. Where condensation may occur, the piping shall be pitched back to the container, or suitable means shall be provided for revaporization of the condensate.

(9) *Hose specifications*. (i) Hose shall be fabricated of materials that are resistant to the action of LP-Gas in the liquid and vapor phases. If wire braid is used for reinforcing the hose, it shall be of corrosion-resistant material such as stainless steel.

(ii) Hose subject to container pressure shall be marked "LP-Gas" or "LPG" at not greater than 10-foot intervals.

(iii) Hose subject to container pressure shall be designed for a bursting pressure of not less than 1,250 p.s.i.g.

(iv) Hose subject to container pressure shall have its correctness as to design construction and performance determined by being listed (see § 1910.110 (a)(15)).

(v) Hose connections subject to container pressure shall be capable of withstanding, without leakage, a test pressure of not less than 500 p.s.i.g.

(vi) Hose and hose connections on the low-pressure side of the regulator or reducing valve shall be designed for a bursting pressure of not less than 125 p.s.i.g or five times the set pressure of the relief devices protecting that portion of the system, whichever is higher.

(vii) Hose may be used on the low-pressure side of regulators to connect to other than domestic and commercial gas appliances under the following conditions:

(*a*) The appliances connected with hose shall be portable and need a flexible connection.

(*b*) For use inside buildings the hose shall be of minimum practical length, but shall not exceed 6 feet except as provided in pargraph (c)(5)(i)(*g*) of this section and shall not extend from one room to another, nor pass through any walls, partitions, ceilings, or floors. Such hose shall not be concealed from view or used in a concealed location. For use outside of buildings, the hose may exceed this length but shall be kept as short as practical.

(*c*) The hose shall be approved and shall not be used where it is likely to be subjected to temperatures above 125° F. The hose shall be securely connected to the appliance and the use of rubber slip ends shall not be permitted.

(*d*) The shutoff valve for an appliance connected by hose shall be in the metal pipe or tubing and not at the appliance end of the hose. When shutoff valves are installed close to each other, precautions shall be taken to prevent operation of the wrong valve.

(*e*) Hose used for connecting to wall outlets shall be protected from physical damage.

(10) *Safety devices*. (i) Every container except those constructed in accordance with DOT specifications and every vaporizer (except motor fuel vaporizers and except vaporizers described in subparagraph (11)(ii)(*c*) of this paragraph and paragraph (d)(4)(v)(*a*) of this section) whether heated by artificial means or not, shall be provided with one or more safety relief valves of spring-loaded or equivalent type. These valves shall be arranged to afford free vent to the outer air with discharge not less than 5 feet horizontally away from any opening into the building which is below such discharge. The rate of discharge shall be in accordance with the requirements of subdivision (ii) of this subparagraph or subdivision (iii) of this subparagraph in the case of vaporizers.

(ii) Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start to discharge pressure for safety relief valves to be used on containers other than those constructed in accordance with DOT specification shall be as follows:

Surface area (sq. ft.)	*Flow rate CFM air*
20 or less	626
25	751
30	872
35	990
40	1,100
45	1,220
50	1,330
55	1,430
60	1,540
65	1,640
70	1,750
75	1,850
80	1,950
85	2,050
90	2,150
95	2,240
100	2,340
105	2,440
110	2,530
115	2,630
120	2,720
125	2,810
130	2,900
135	2,990
140	3,080
145	3,170
150	3,260
155	3,350
160	3,440
165	3,530
170	3,620
175	3,700

Surface area (sq. ft.)	*Flow rate CFM air*
180	3,790
185	3,880
190	3,960
195	4,050
200	4,130
210	4,300
220	4,470
230	4,630
240	4,800
250	4,960
260	5,130
270	5,290
280	5,450
290	5,610
300	5,760
310	5,920
320	6,080
330	6,230
340	6,390
350	6,540
360	6,690
370	6,840
380	7,000
390	7,150
400	7,300
450	8,040
500	8,760
550	9,470
600	10,170
650	10,860
700	11,550
750	12,220
800	12,880
850	13,540
900	14,190
950	14,830
1,000	15,470
1,050	16,100
1,100	16,720
1,150	17,350
1,200	17,960
1,250	18,570
1,300	19,180
1,350	19,780
1,400	20,380
1,450	20,980
1,500	21,570
1,550	22,160
1,600	22,740
1,650	23,320
1,700	23,900
1,750	24,470
1,800	25,050
1,850	25,620
1,900	26,180
1,950	26,750
2,000	27,310

Surface area=total outside surface area of container in square feet.

When the surface area is not stamped on the nameplate or when the marking is not legible, the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads:

Area=Overall length×outside diameter×3.1416.

(2) Cylindrical container with other than hemispherical heads:

Area=(Overall length+0.3 outside diameter)×outside diameter×3.1416.

NOTE: This formula is not exact, but will give results within the limits of practical accuracy for the sole purpose of sizing relief valves.

(3) Spherical container:

Area=Outside diameter squared×3.1416.

Flow Rate-CFM Air=Required flow capacity in cubic feet per minute of air at standard conditions, 60 F. and atmospheric pressure (14.7 p.s.i.a.).

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,000 square feet, the required flow rate can be calculated using the formula, Flow Rate-CFM Air=53.632 $A^{0.82}$.

A=total outside surface area of the container in square feet.

Valves not marked "Air" have flow rate marking in cubic feet per minute of liquefied petroleum gas. These can be converted to ratings in cubic feet per minute of air by multiplying the liquefied petroleum gas ratings by factors listed below. Air flow ratings can be converted to ratings in cubic feet per minute of liquefied petroleum gas by dividing the air ratings by the factors listed below.

AIR CONVERSION FACTORS

Container type	100	125	150	175	200
Air conversion factor	1.162	1.142	1.113	1.078	1.010

(iii) Minimum Required Rate of Discharge for Safety Relief Valves for Liquefied Petroleum Gas Vaporizers (Steam Heated, Water Heated, and Direct Fired).

The minimum required rate of discharge for safety relief valves shall be determined as follows:

(*a*) Obtain the total surface area by adding the surface area of vaporizer shell in square feet directly in contact with LP-Gas and the heat exchanged surface area in square feet directly in contact with LP-Gas.

(*b*) Obtain the minimum required rate of discharge in cubic feet of air per minute, at 60° F. and 14.7 p.s.i.a. from subdivision (ii) of this subparagraph, for this total surface area.

(iv) Container and vaporizer safety relief valves shall be set to start-to-discharge, with relation to the design pressure of the container, in accordance with Table H-26.

TABLE H-26

Containers	Minimum (percent)	Maximum (percent)
ASME Code; Par. U-68, U-69—1949 and earlier editions	110	[1] 125
ASME Code; Par. U-200, U-201—1949 edition	88	[1] 100
ASME Code—1950, 1952, 1956, 1959, 1962, 1965 and 1968 (Division I) editions	88	[1] 100
API—ASME Code—all editions	88	[1] 100
DOT—As prescribed in 49 CFR Chapter I		

[1] Manufacturers of safety relief valves are allowed a plus tolerance not exceeding 10 percent of the set pressure marked on the valve.

(v) Safety relief devices used with systems employing containers other than those constructed according to DOT specifications shall be so constructed as to discharge at not less than the rates shown in subdivision (ii) of this subparagraph, before the pressure is in excess of 120 percent of the maximum (not including the 10 percent referred to in subdivision (iv) of this subparagraph) permitted start to discharge pressure setting of the device.

(vi) In certain locations sufficiently sustained high temperatures prevail which require the use of a lower vapor pressure product to be stored or the use of a higher designed pressure vessel in order to prevent the safety valves opening as the result of these temperatures. As an alternative the tanks may be protected by cooling devices such as by spraying, by shading, or other effective means.

(vii) Safety relief valves shall be arranged so that the possibility of tampering will be minimized. If pressure setting or adjustment is external, the relief valves shall be provided with approved means for sealing adjustment.

(viii) Shutoff valves shall not be installed between the safety relief devices and the container, or the equipment or piping to which the safety relief device is connected except that a shutoff valve may be used where the arrangement of this valve is such that full required capacity flow through the safety relief device is always afforded.

(ix) Safety relief valves shall have direct communication with the vapor space of the container at all times.

(x) Each container safety relief valve used with systems covered by paragraphs (d), (e), (g), and (h) of this section, except as provided in paragraph (e)(3)(iii) of this section shall be plainly and permanently marked with the following: "Container Type" of the pressure vessel on which the valve is designed to be installed; the pressure in p.s.i.g. at which the valve is set to discharge; the actual rate of discharge of the valve in cubic feet per minute of air at 60° F. and 14.7 p.s.i.a.; and the manufacturer's name and catalog number, for example: T200–250–4050 AIR—indicating that the valve is suitable for use on a Type 200 container, that it is set to start to discharge at 250 p.s.i.g.; and that its rate of discharge is 4,050 cubic feet per minute of air as determined in subdivision (ii) of this subparagraph.

(xi) Safety relief valve assemblies, including their connections, shall be of sufficient size so as to provide the rate of flow required for the container on which they are installed.

(xii) A hydrostatic relief valve shall be installed between each pair of shutoff valves on liquefied petroleum gas liquid piping so as to relieve into a safe atmosphere. The start-to-discharge pressure setting of such relief valves shall not be in excess of 500 p.s.i.g. The minimum setting on relief valves installed in piping connected to other than DOT containers shall not be lower than 140 percent of the container relief valve setting and in piping connected to DOT containers not lower than 400 p.s.i.g. Such a relief valve should not be installed in the pump discharge piping if the same protection can be provided by installing the relief valve in the suction piping. The start-to-discharge pressure setting of such a relief valve, if installed on the discharge side of a pump, shall be greater than the maximum pressure permitted by the recirculation device in the system.

(xiii) The discharge from any safety relief device shall not terminate in or beneath any building, except relief devices covered by subparagraphs (6) (i) (*a*)–(*e*) of this paragraph, or paragraphs, (c) (4) (i) or (5) of this section.

(xiv) Container safety relief devices and regulator relief vents shall be located not less than five (5) feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

(11) *Vaporizer and housing.* (i) Indirect fired vaporizers utilizing steam, water, or other heating medium shall be constructed and installed as follows:

(*a*) Vaporizers shall be constructed in accordance with the requirements of subparagraph (3) (i)–(iii) of this paragraph and shall be permanently marked as follows:

(*1*) With the code marking signifying the specifications to which the vaporizer is constructed.

(*2*) With the allowable working pressure and temperature for which the vaporizer is designed.

(*3*) With the sum of the outside surface area and the inside heat exchange surface area expressed in square feet.

(*4*) With the name or symbol of the manufacturer.

(*b*) Vaporizers having an inside diameter of 6 inches or less exempted by the ASME Unfired Pressure Vessel Code, Section VIII of the ASME Boiler and Pressure Vessel Code—1968 shall have a design pressure not less than 250 p.s.i.g. and need not be permanently marked.

(*c*) Heating or cooling coils shall not be installed inside a storage container.

(*d*) Vaporizers may be installed in buildings, rooms, sheds, or lean-tos used exclusively for gas manufacturing or distribution, or in other structures of light, noncombustible construction or equivalent, well ventilated near the floor line and roof.

When vaporizing and/or mixing equipment is located in a structure or building not used exclusively for gas manufacturing or distribution, either attached to or within such a building, such structure or room shall be separated from the remainder of the building by a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall shall have no openings or pipe or conduit passing through it. Such structure or room shall be provided with adequate ventilation and shall have a roof or at least one exterior wall of lightweight construction.

(*e*) Vaporizers shall have, at or near the discharge, a safety relief valve providing an effective rate of discharge in accordance with subparagraph (10(iii) of this paragraph, except as provided in paragraph (d) (4) (v) (*a*), of this section.

(*f*) The heating medium lines into and leaving the vaporizer shall be provided with suitable means for preventing the flow of gas into the heat systems in the event of tube rupture in the vaporizer. Vaporizers shall be provided with suitable automatic means to prevent liquid passing through the vaporizers to the gas discharge piping.

(*g*) The device that supplies the necessary heat for producing steam, hot water, or other heating medium may be installed in a building, compartment, room, or lean-to which shall be ventilated near the floorline and roof to the outside. The device location shall be separated from all compartments or rooms containing liquefied petroleum gas vaporizers, pumps, and central gas mixing devices by a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall shall have no openings or pipes or conduit passing through it. This requirement does not apply to the domestic water heaters which may supply heat for a vaporizer in a domestic system.

(*h*) Gas-fired heating systems supplying heat exclusively for vaporization purposes shall be equipped with automatic safety devices to shut off the flow of gas to main burners, if the pilot light should fail.

(*i*) Vaporizers may be an integral part of a fuel storage container directly connected to the liquid section or gas section or both.

(*j*) Vaporizers shall not be equipped with fusible plugs.

(*k*) Vaporizer houses shall not have unprotected drains to sewers or sump pits.

(ii) Atmospheric vaporizers employing heat from the ground or surrounding air shall be installed as follows:

(*a*) Buried underground, or

(*b*) Located inside the building close to a point at which pipe enters the building provided the capacity of the unit does not exceed 1 quart.

(*c*) Vaporizers of less than 1 quart capacity heated by the ground or surrounding air, need not be equipped with safety relief valves provided that adequate tests demonstrate that the assembly is safe without safety relief valves.

(iii) Direct gas-fired vaporizers shall be constructed, marked, and installed as follows:

(*a*) (*1*) In accordance with the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code—1968 that are applicable to the maximum working conditions for which the vaporizer is designed.

(*2*) With the name of the manufacturer; rated BTU input to the burner; the area of the heat exchange surface in square feet; the outside surface of the vaporizer in square feet; and the maximum vaporizing capacity in gallons per hour.

(*b*) (*1*) Vaporizers may be connected to the liquid section or the gas section of the storage container, or both; but in any case there shall be at the container a manually operated valve in each connection to permit completely shutting off when desired, of all flow of gas or liquid from container to vaporizer.

(*2*) Vaporizers with capacity not exceeding 35 gallons per hour shall be located at least 5 feet from container shutoff valves. Vaporizers having capacity of more than 35 gallons but not exceeding 100 gallons per hour shall be located at least 10 feet from the container shutoff valves. Vaporizers having a capacity greater than 100 gallons per hour shall be located at least 15 feet from container shutoff valves.

(*c*) Vaporizers may be installed in buildings, rooms, housings, sheds, or lean-tos used exclusively for vaporizing or mixing of liquefied petroleum gas. Vaporizing housing structures shall be of noncombustible construction, well ventilated near the floorline and the highest point of the roof. When vaporizer and/or mixing equipment is located in a structure or room attached to or within a building, such structure or room shall be separated from the remainder of the building by a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall shall have no openings or pipes or conduit passing through it. Such structure or room shall be provided with adequate ventilation, and shall have a roof or at least one exterior wall of lightweight construction.

(*d*) Vaporizers shall have at or near the discharge, a safety relief valve providing an effective rate of discharge in accordance with subparagraph (10) (iii) of this paragraph. The relief valve shall be so located as not to be subjected to temperatures in excess of 140° F.

(*e*) Vaporizers shall be provided with suitable automatic means to prevent liquid passing from the vaporizer to the gas discharge piping of the vaporizer.

(*f*) Vaporizers shall be provided with means for manually turning off the gas to the main burner and pilot.

(*g*) Vaporizers shall be equipped with automatic safety devices to shut off the flow of gas to main burners if the pilot light should fail. When the flow through the pilot exceeds 2,000 B.t.u. per hour, the pilot also shall be equipped with an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished.

(*h*) Pressure regulating and pressure reducing equipment if located within 10 feet of a direct fired vaporizer shall be separated from the open flame by a substantially airtight noncombustible partition or partitions.

(*i*) Except as provided in (*c*) of this subdivision, the following minimum distances shall be maintained between direct fired vaporizers and the nearest important building or group of buildings or line of adjoining property which may be built upon:

Ten feet for vaporizers having a capacity of 15 gallons per hour or less vaporizing capacity.

Twenty-five feet for vaporizers having a vaporizing capacity of 16 to 100 gallons per hour.

Fifty feet for vaporizers having a vaporizing capacity exceeding 100 gallons per hour.

(*j*) Direct fired vaporizers shall not raise the product pressure above the design pressure of the vaporizer equipment nor shall they raise the product pressure within the storage container above the pressure shown in the second column of Table H–31.

(*k*) Vaporizers shall not be provided with fusible plugs.

(*l*) Vaporizers shall not have unprotected drains to sewers or sump pits.

(iv) Direct gas-fired tank heaters shall be constructed and installed as follows:

(*a*) Direct gas-fired tank heaters, and tanks to which they are applied, shall only be installed above ground.

(*b*) Tank heaters shall be permanently marked with the name of the manufacturer, the rated B.t.u. input to the burner, and the maximum vaporizing capacity in gallons per hour.

(*c*) Tank heaters may be an integral part of a fuel storage container directly connected to the container liquid section, or vapor section, or both.

(*d*) Tank heaters shall be provided with a means for manually turning off the gas to the main burner and pilot.

(*e*) Tank heaters shall be equipped with an automatic safety device to shut off the flow of gas to main burners, if the pilot light should fail. When flow through pilot exceeds 2,000 B.t.u. per hour, the pilot also shall be equipped with an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished.

(*f*) Pressure regulating and pressure reducing equipment if located within 10 feet of a direct fired tank heater shall be separated from the open flame by a substantially airtight noncombustible partition.

(*g*) The following minimum distances shall be maintained between a storage tank heated by a direct fired tank heater and the nearest important building or group of buildings or line of adjoining property which may be built upon:

Ten feet for storage containers of less than 500 gallons water capacity.

Twenty-five feet for storage containers of 500 to 1,200 gallons water capacity.

Fifty feet for storage containers of over 1,200 gallons water capacity.

(*h*) No direct fired tank heater shall raise the product pressure within the storage container over 75 percent of the pressure set out in the second column of Table H-31.

(v) The vaporizer section of vaporizer-burners used for dehydrators or dryers shall be located outside of buildings; they shall be constructed and installed as follows:

(*a*) Vaporizer-burners shall have a minimum design pressure of 250 p.s.i.g. with a factor of safety of five.

(*b*) Manually operated positive shutoff valves shall be located at the containers to shut off all flow to the vaporizer-burners.

(*c*) Minimum distances between storage containers and vaporizer-burners shall be as follows:

Water capacity per container (gallons)	*Minimum distances (feet)*
Less than 501	10
501 to 2,000	25
Over 2,000	50

(*d*) The vaporizer section of vaporizer-burners shall be protected by a hydrostatic relief valve. The relief valve shall be located so as not to be subjected to temperatures in excess of 140° F. The start-to-discharge pressure setting shall be such as to protect the components involved, but not less than 250 p.s.i.g. The discharge shall be directed upward and away from component parts of the equipment and away from operating personnel.

(*e*) Vaporizer-burners shall be provided with means for manually turning off the gas to the main burner and pilot.

(*f*) Vaporizer-burners shall be equipped with automatic safety devices to shut off the flow of gas to the main burner and pilot in the event the pilot is extinguished.

(*g*) Pressure regulating and control equipment shall be located or protected so that the temperatures surrounding this equipment shall not exceed 140° F. except that equipment components may be used at higher temperatures if designed to withstand such temperatures.

(*h*) Pressure regulating and control equipment when located downstream of the vaporizer shall be designed to withstand the maximum discharge temperature of the vapor.

(*i*) The vaporizer section of vaporizer-burners shall not be provided with fusible plugs.

(*j*) Vaporizer coils or jackets shall be made of ferrous metal or high temperature alloys.

(*k*) Equipment utilizing vaporizer-burners shall be equipped with automatic shutoff devices upstream and downstream of the vaporizer section connected so as to operate in the event of excessive temperature, flame failure, and, if applicable, insufficient airflow.

(12) *Filling densities.* (i) The "filling density" is defined as the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60° F. All containers shall be filled according to the filling densities shown in Table H-27.

TABLE H-27—MAXIMUM PERMITTED FILLING DENSITY

Specific gravity at 60° F. (15.6° C.)	Aboveground containers: 0 to 1,200 U.S. gals. (1,000 imp. gal., 4,550 liters) total water cap.	Aboveground containers: Over 1,200 U.S. gals. (1,000 imp. gal., 4,550 liters) total water cap.	Underground containers, all capacities
	Percent	*Percent*	*Percent*
0.496-0.503	41	44	45
.504-.510	42	45	46
.511-.519	43	46	47
.520-.527	44	47	48
.528-.536	45	48	49
.537-.544	46	49	50
.545-.552	47	50	51
.553-.560	48	51	52
.561-.568	49	52	53
.569-.576	50	53	54
.577-.584	51	54	55
.585-.592	52	55	56
.593-.600	53	56	57

(ii) Except as provided in subdivision (iii) of this subparagraph, any container including mobile cargo tanks and portable tank containers regardless of size or construction, shipped under DOT jurisdiction or constructed in accordance with 49 CFR Chapter I Specifications shall be charged according to 49 CFR Chapter I requirements.

(iii) Portable containers not subject to DOT jurisdiction (such as, but not limited to, motor fuel containers on industrial and lift trucks, and farm tractors covered in paragraph (e) of this section, or containers recharged at the installation) may be filled either by weight, or by volume using a fixed length dip tube gaging device.

(13) *LP-Gas in buildings.* (i) Vapor shall be piped into buildings at pressures in excess of 20 p.s.i.g. only if the buildings or separate areas thereof, (*a*) are constructed in accordance with this section; (*b*) are used excusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard; (*c*) buildings, structures, or equipment under construction or undergoing major renovation.

(ii) Liquid may be permitted in buildings as follows:

(*a*) Buildings, or separate areas of buildings, used exclusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard; and when such buildings, or separate areas thereof are constructed in accordance with this section.

(*b*) Buildings, structures, or equipment under construction or undergoing major renovation provided the temporary piping meets the following conditions:

(*1*) Liquid piping inside the building shall conform to the requirements of subparagraph (8) of this paragraph, and shall not exceed three-fourths iron pipe size. Copper tubing with an outside diameter of three-fourths inch or less may be used provided it conforms to Type K of Specifications for Seamless Water Tube, ANSI H23.1-1970 (ASTM B88-69) (see Table H-24). All such piping shall be protected against construction hazards. Liquid piping inside buildings shall be kept to a minimum. Such piping shall be securely fastened to walls or other surfaces so as to provide adequate protection from breakage and so located as to subject the liquid line to lowest ambient temperatures.

(*2*) A shutoff valve shall be installed in each intermediate branch line where it takes off the main line and shall be readily accessible. A shutoff valve shall also be placed at the appliance end of the intermediate branch line. Such shutoff valve shall be upstream of any flexible connector used with the appliance.

(*3*) Suitable excess flow valves shall be installed in the container outlet line supplying liquid LP-Gas to the building. A suitable excess flow valve shall be installed immediately downstream of each shutoff valve. Suitable excess flow valves shall be installed where piping size is reduced and shall be sized for the reduced size piping.

(*4*) Hydrostatic relief valves shall be installed in accordance with subparagraph (10)(xii) of this paragraph.

(5) The use of hose to carry liquid between the container and the building or at any point in the liquid line, except at the appliance connector, shall be prohibited.

(6) Where flexible connectors are necessary for appliance installation, such connectors shall be as short as practicable and shall comply with subparagraph (8)(ii) or (9) of this paragraph.

(7) Release of fuel when any section of piping or appliances is disconnected shall be minimized by either of the following methods:

(*i*) Using an approved automatic quick-closing coupling (a type closing in both directions when coupled in the fuel line), or

(*ii*) Closing the valve nearest to the appliance and allowing the appliance to operate until the fuel in the line is consumed.

(iii) Portable containers shall not be taken into buildings except as provided in subparagraph (6)(i) of this paragraph.

(14) *Transfer of liquids.* The employer shall assure that (i) at least one attendant shall remain close to the transfer connection from the time the connections are first made until they are finally disconnected, during the transfer of the product.

(ii) Containers shall be filled or used only upon authorization of the owner.

(iii) Containers manufactured in accordance with specifications of 49 CFR Part 178 and authorized by 49 CFR Chapter 1 as a "single trip" or "nonrefillable container" shall not be refilled or reused in LP-Gas service.

(iv) Gas or liquid shall not be vented to the atmosphere to assist in transferring contents of one container to another, except as provided in paragraph (e)(5)(iv) of this section and except that this shall not preclude the use of listed pump utilizing LP-Gas in the vapor phase as a source of energy and venting such gas to the atmosphere at a rate not to exceed that from a No. 31 drill size opening and provided that such venting and liquid transfer shall be located not less than 50 feet from the nearest important building.

(v) Filling of fuel containers for industrial trucks or motor vehicles from industrial bulk storage containers shall be performed not less than 10 feet from the nearest important masonry-walled building or not less than 25 feet from the nearest important building or other construction and, in any event, not less than 25 feet from any building opening.

(vi) Filling of portable containers, containers mounted on skids, fuel containers on farm tractors, or similar applications, from storage containers used in domestic or commercial service, shall be performed not less than 50 feet from the nearest important building.

(vii) The filling connection and the vent from the liquid level gages in containers, filled at point of installation, shall not be less than 10 feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

(viii) Fuel supply containers shall be gaged and charged only in the open air or in buildings especially provided for that purpose.

(ix) The maximum vapor pressure of the product at 100° F. which may be transferred into a container shall be in accordance with paragraphs (d)(2) and (e)(3) of this section. (For DOT containers use DOT requirements.)

(x) Marketers and users shall exercise precaution to assure that only those gases for which the system is designed, examined, and listed, are employed in its operation, particularly with regard to pressures.

(xi) Pumps or compressors shall be designed for use with LP-Gas. When compressors are used they shall normally take suction from the vapor space of the container being filled and discharge to the vapor space of the container being emptied.

(xii) Pumping systems, when equipped with a positive displacement pump, shall include a recirculating device which shall limit the differential pressure on the pump under normal operating conditions to the maximum differential pressure rating of the pump. The discharge of the pumping system shall be protected so that pressure does not exceed 350 p.s.i.g. If a recirculation system discharges into the supply tank and contains a manual shutoff valve, an adequate secondary safety recirculation system shall be incorporated which shall have no means of rendering it inoperative. Manual shutoff valves in recirculation systems shall be kept open except during an emergency or when repairs are being made to the system.

(xiii) When necessary, unloading piping or hoses shall be provided with suitable bleeder valves for relieving pressure before disconnection.

(xvi) Agricultural air moving equipment, including crop dryers, shall be shut down when supply containers are being filled unless the air intakes and sources of ignition on the equipment are located 50 feet or more from the container.

(xv) Agricultural equipment employing open flames or equipment with integral containers, such as flame cultivators, weed burners, and, in addition, tractors, shall be shut down during refueling.

(15) *Tank car or transport truck loading or unloading points and operations.* (i) The track of tank car siding shall be relatively level.

(ii) A "Tank Car Connected" sign, as covered by DOT rules, shall be installed at the active end or ends of the siding while the tank car is connected.

(iii) While cars are on sidetrack for loading or unloading, the wheels at both ends shall be blocked on the rails.

(iv) The employer shall insure that an employee is in attendance at all times while the tank car, cars, or trucks are being loaded or unloaded.

(v) A backflow check valve, excess-flow valve, or a shutoff valve with means of remote closing, to protect against uncontrolled discharge of LP-Gas from storage tank piping shall be installed close to the point where the liquid piping and hose or swing joint pipe is connected.

(vi) Except as provided in subdivision (vii) of this subparagraph, when the size (diameter) of the loading or unloading hoses and/or piping is reduced below the size of the tank car or transport truck loading or unloading connections, the adaptors to which lines are attached shall be equipped with either a backflow check valve, a properly sized excess flow valve, or shutoff valve with means of remote closing, to protect against uncontrolled discharge from the tank car or transport truck.

(vii) The requirement of subdivision (vi) of this subparagraph shall not apply if the tank car or transport is equipped with a quick-closing internal valve that can be remotely closed.

(viii) The tank car or transport truck loading or unloading point shall be located with due consideration to the following:

(*a*) Proximity to railroads and highway traffic.

(*b*) The distance of such unloading or loading point from adjacent property.

(*c*) With respect to buildings on installer's property.

(*d*) Nature of occupancy.

(*e*) Topography.

(*f*) Type of construction of buildings.

(*g*) Number of tank cars or transport trucks that may be safely loaded or unloaded at one time.

(*h*) Frequency of loading or unloading.

(ix) Where practical, the distance of the unloading or loading point shall conform to the distances in subparagraph (6)(ii) of this paragraph.

(16) *Instructions.* Personnel performing installation, removal, operation, and maintenance work shall be properly trained in such function.

(17) *Electrical equipment and other sources of ignition.* (i) Electrical equipment and wiring shall be of a type specified by and shall be installed in accordance with Subpart S of this part, for ordinary locations except that fixed electrical equipment in classified areas shall comply with subparagraph (18) of this paragraph.

(ii) Open flames or other sources of ignition shall not be permitted in vaporizer rooms (except those housing direct-fired vaporizers), pumphouses, container charging rooms or other similar locations. Direct-fired vaporizers shall not be permitted in pumphouses or container charging rooms.

(iii) Liquefied petroleum gas storage containers do not require lightning protection.

(iv) Since liquefied petroleum gas is contained in a closed system of piping and equipment, the system need not be electrically conductive or electrically bonded for protection against static electricity.

(v) Open flames (except as provided for in subparagraph (11) of this paragraph), cutting or welding, portable electric tools, and extension lights capable of igniting LP-Gas, shall not be permitted within classified areas specified in Table H–28 unless the LP-Gas facilities have been freed of all liquid and vapor, or special precautions observed under carefully controlled conditions.

TABLE H-28

Part	Location	Extent of classified area[1]	Equipment shall be suitable for National Electrical Code, Class 1, Group D[2]
A	Storage containers other than DOT cylinders.	Within 15 feet in all directions from connections, except connections otherwise covered in Table H-28.	Division 2.
B	Tank vehicle and tank car loading and unloading.[3]	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade. (See Figure H-1).	Division 2.
C	Gage vent openings other than those on DOT cylinders.	Within 5 feet in all directions from point of discharge.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from point of discharge.	Division 2.
D	Relief valve discharge other than those on DOT cylinders.	Within direct path of discharge.	Divison 1. *Note*—Fixed electrical equipment should preferably not be installed.
		Within 5 feet in all directions from point of discharge.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from point of discharge except within the direct path of discharge.	Division 2.
E	Pumps, compressors, gas-air mixers and vaporizers other than direct fired.	--	
	Indoors without ventilation	Entire room and any adjacent room not separated by a gastight partition.	Division 1.
		Within 15 feet of the exterior side of any exterior wall or roof that is not vaportight or within 15 feet of any exterior opening.	Division 2.
	Indoors with adequate ventilation.[4]	Entire room and any adjacent room not separated by a gastight partition.	Division 2.
	Outdoors in open air at or abovegrade.	Within 15 feet in all directions from this equipment and within the cylindrical volume between the horizontal equator of the sphere and grade. See Figure H-1.	Division 2.
F	Service Station Dispensing Units.	Entire space within dispenser enclosure, and 18 inches horizontally from enclosure exterior up to an elevation 4 ft. above dispenser base. Entire pit or open space beneath dispenser.	Division 1.
		Up to 18 inches abovegrade within 20 ft. horizontally from any edge of enclosure. Note: For pits within this area, see Part F of this table.	Division 2.
G	Pits or trenches containing or located beneath LP-Gas valves, pumps, compressors, regulators, and similar equipment.	--	
	Without mechanical ventilation.	Entire pit or trench	Division 1.
		Entire room and any adjacent room not separated by a gastight partition.	Division 2.
		Within 15 feet in all directions from pit or trench when located outdoors.	Division 2.
	With adequate mechanical ventilation.	Entire pit or trench	Division 2.
		Entire room and any adjacent room not separated by a gastight partition.	Division 2.
		Within 15 feet in all directions from pit or trench when located outdoors.	Division 2.
H	Special buildings or rooms for storage of portable containers.	Entire room	Division 2.
I	Pipelines and connections containing operational bleeds, drips, vents or drains.	Within 5 ft. in all directions from point of discharge	Division 1.
		Beyond 5 ft. from point of discharge, same as Part E of this table.	
J	Container filling:		
	Indoors without ventilation	Entire room	Division 1.
	Indoors with adequate ventilation.[4]	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet and entire room	Division 2.
	Outdoors in open air	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade. (See Figure H-1).	Division 2.

---

[1] The classified area shall not extend beyond an unpierced wall, roof, or solid vaportight partition.

[2] See Subpart S of this part.

[3] When classifying extent of hazardous area, consideration shall be given to possible variations in the spotting of tank cars and tank vehicles at the unloading points and the effect these variations of actual spotting point may have on the point of connection.

[4] Ventilation, either natural or mechanical, is considered adequate when the concentration of the gas in a gas-air mixture does not exceed 25 percent of the lower flammable limit under normal operating conditions.

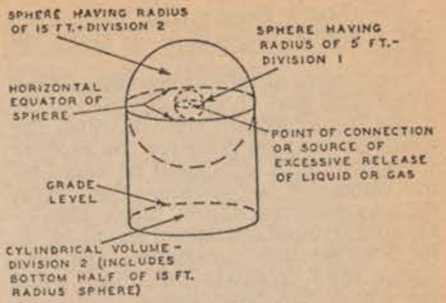

SPHERE HAVING RADIUS OF 15 FT.-DIVISION 2
SPHERE HAVING RADIUS OF 5 FT.-DIVISION 1
HORIZONTAL EQUATOR OF SPHERE
POINT OF CONNECTION OR SOURCE OF EXCESSIVE RELEASE OF LIQUID OR GAS
GRADE LEVEL
CYLINDRICAL VOLUME-DIVISION 2 (INCLUDES BOTTOM HALF OF 15 FT. RADIUS SPHERE)

Figure H-1

(18) *Fixed electrical equipment in classified areas.* Fixed electrical equipment and wiring installed within classified areas specified in Table H-28 shall comply with Table H-28 and shall be installed in accordance with Subpart S of this part. This provision does not apply to fixed electrical equipment at residential or commercial installations of LP-Gas systems or to systems covered by paragraph (e) or (g) of this section.

(19) *Liquid-level gaging device.* (i) Each container manufactured after December 31, 1965, and filled on a volumetric basis shall be equipped with a fixed liquid-level gage to indicate the maximum permitted filling level as provided in subdivision (v) of this subparagraph. Each container manufactured after December 31, 1969, shall have permanently attached to the container adjacent to the fixed level gage a marking showing the percentage full that will be shown by that gage. When a variable liquid-level gage is also provided, the fixed liquid-level gage will also serve as a means for checking the variable gage. These gages shall be used in charging containers as required in subparagraph (12) of this paragraph.

(ii) All variable gaging devices shall be arranged so that the maximum liquid level for butane, for a 50-50 mixture of butane and propane, and for propane, to which the container may be charged is readily determinable. The markings indicating the various liquid levels from empty to full shall be on the system nameplate or gaging device or part may be on the system nameplate and part on the gaging device. Dials of magnetic or rotary gages shall show whether they are for cylindrical or spherical containers and whether for aboveground or underground service. The dials of gages intended for use only on aboveground containers of over 1,200 gallons water capacity shall be so marked.

(iii) Gaging devices that require bleeding of the product to the atmosphere, such as the rotary tube, fixed tube, and slip tube, shall be designed so that the bleed valve maximum opening is not larger than a No. 54 drill size, unless provided with excess flow valve.

(iv) Gaging devices shall have a design working pressure of at least 250 p.s.i.g.

(v) Length of tube or position of fixed liquid-level gage shall be designed to indicate the maximum level to which the container may be filled for the product contained. This level shall be based on the volume of the product at 40° F. at its maximum permitted filling density for aboveground containers and at 50° F. for underground containers. The employer shall calculate the filling point for which the fixed liquid level gage shall be designed according to the method in this subdivision.

(*a*) It is impossible to set out in a table the length of a fixed dip tube for various capacity tanks because of the varying tank diameters and lengths and because the tank may be installed either in a vertical or horizontal position. Knowing the maximum permitted filling volume in gallons, however, the length of the fixed tube can be determined by the use of a strapping table obtained from the container manufacturer. The length of the fixed tube should be such that when its lower end touches the surface of the liquid in the container, the contents of the container will be the maximum permitted volume as determined by the following formula:

$$\frac{\text{Water capacity (gals.) of container}^{*}\times\text{filling density}^{**}}{\text{Specific gravity of LP-Gas}^{*}\times\text{volume correction factor}^{\dagger}\times 100}=\text{Maximum volume of LP-Gas}$$

*Measured at 60° F.

**From subparagraph (12) of this paragraph "Filling Densities."

†For aboveground containers the liquid temperature is assumed to be 40° F. and for underground containers the liquid temperature is assumed to be 50° F. To correct the liquid volumes at these temperatures to 60° F. the following factors shall be used.

(*b*) Formula for determining maximum volume of liquefied petroleum gas for which a fixed length of dip tube shall be set:

TABLE H-29—VOLUME CORRECTION FACTORS

Specific gravity	Aboveground	Underground
0.500	1.033	1.017
.510	1.031	1.016
.520	1.029	1.015
.530	1.028	1.014
.540	1.026	1.013
.550	1.025	1.013
.560	1.024	1.012
.570	1.023	1.011
.580	1.021	1.011
.590	1.020	1.010

(*c*) The maximum volume of LP-Gas which can be placed in a container when determining the length of the dip tube expressed as a percentage of total water content of the container is calculated by the following formula.

(*d*) The maximum weight of LP-Gas which may be placed in a container *for determining the length of a fixed dip tube* is determined by multiplying the maximum volume of liquefied petroleum gas obtained by the formula in (*b*) of this subdivision by the pounds of liquefied petroleum gas in a gallon at 40° F. for aboveground and at 50° F. for underground containers. For example, typical pounds per gallon are specified below:

Example: Assume a 100-gallon total water capacity tank for aboveground storage of propane having a specific gravity of 0.510 of 60° F.

$$\frac{100\text{ (gals.)}\times 42\text{ (filling density from subparagraph (12) of this paragraph)}}{0.510\times 1.031\text{ (correction factor from Table H-29)}\times 100}=\frac{4200}{52.6}$$

$\frac{4200}{52.6}$ = 79.8 gallons propane, the maximum amount permitted to be placed in a 100-gallon total water capacity aboveground container equipped with a fixed dip tube.

$$\frac{\text{Maximum volume of LP-Gas (from formula in subdivision (}b\text{) of this subdivision)}\times 100}{\text{Total water content of container in gallons}}=\text{Maximum percent of LP-Gas}$$

	Aboveground, pounds per gallon	Underground, pounds per gallon
Propane	4.37	4.31
N Butane	4.97	4.92

(vi) Fixed liquid-level gages used on containers other than DOT containers shall be stamped on the exterior of the gage with the letters "DT" followed by the vertical distance (expressed in inches and carried out to one decimal place) from the top of container to the end of the dip tube or to the centerline of the gage when it is located at the maximum permitted filling level. For portable containers that may be filled in the horizontal and/or vertical position the letters "DT" shall be followed by "V" with the vertical distance from the top of the container to the end of the dip tube for vertical filling and with "H" followed by the proper distance for horizontal filling. For DOT containers the stamping shall be placed both on the exterior of the gage and on the container. On aboveground or cargo containers where the gages are positioned at specific levels, the marking may be specified in percent of total tank contents and the marking shall be stamped on the container.

(vii) Gage glasses of the columnar type shall be restricted to charging plants where the fuel is withdrawn in the liquid phase only. They shall be equipped with valves having metallic handwheels, with excess flow valves, and with extra-heavy glass adequately protected with a metal housing applied by the gage manufacturer. They shall be shielded against the direct rays of the sun. Gage glasses of the columnar type are prohibited on tank trucks, and on motor fuel tanks, and on containers used in domestic, commercial, and industrial installations.

(viii) Gaging devices of the float, or equivalent type which do not require flow for their operation and having connections extending to a point outside the container do not have to be equipped with excess flow valves provided the piping and fittings are adequately designed to withstand the container pressure and are properly protected against physical damage and breakage.

(20) *Requirements for appliances.* (i) Except as provided in subdivision (ii) of this subparagraph, new commercial and industrial gas consuming appliances shall be approved.

(ii) Any appliance that was originally manufactured for operation with a gaseous fuel other than LP-Gas and is in good condition may be used with LP-Gas only after it is properly converted, adapted, and tested for performance with LP-Gas before the appliance is placed in use.

(iii) Unattended heaters used inside buildings for the purpose of animal or poultry production or care shall be equipped with an approved automatic device designed to shut off the flow of gas to the main burners, and pilot if used, in the event of flame extinguishment.

(iv) All commercial, industrial, and agricultural appliances or equipment shall be installed in accordance with the requirements of this section and in accordance with the following:

(*a*) Domestic and commercial appliances—NFPA 54–1969, Standard for the Installation of Gas Appliances and Gas Piping.

(*b*) Industrial appliances—NFPA 54A–1969, Standard for the Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises.

(*c*) Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines—NFPA 37–1970.

(*d*) Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment, NFPA 96–1970.

(c) *Cylinder systems*—(1) *Application.* This paragraph applies specifically to systems utilizing containers constructed in accordance with DOT Specifications. All requirements of paragraph (b) of this section apply to this paragraph unless otherwise noted in paragraph (b) of this section.

(2) *Marking of containers.* (i) Containers shall be marked in accordance with DOT regulations. Additional markings not in conflict with DOT regulations may be used.

(ii) Except as provided in subdivision (iii) of this subparagraph each container shall be marked with its water capacity in pounds or other identified unit of weight.

(iii) If a container is filled and maintained only by the owner or his representative and if the water capacity of each container is identified by a code, compliance with subdivision (ii) of this subparagraph is not required.

(iv) Each container shall be marked with its tare weight in pounds or other identified unit of weight including all permanently attached fittings but not the cap.

(3) *Description of a system.* A system shall include the container base or bracket, containers, container valves, connectors, manifold valve assembly, regulators, and relief valves.

(4) *Containers and regulating equipment installed outside of buildings or structures.* (i) Containers shall not be buried below ground. However, this shall not prohibit the installation in a compartment or recess below grade level, such as a niche in a slope or terrace wall which is used for no other purpose, providing that the container and regulating equipment are not in contact with the ground and the compartment or recess is drained and ventilated horizontally to the outside air from its lowest level, with the outlet at least 3 feet away from any building opening which is below the level of such outlet.

Except as provided in paragraph (b) (10) (xiii) of this section, the discharge from safety relief devices shall be located not less than 3 feet horizontally away from any building opening which is below the level of such discharge and shall not terminate beneath any building unless such space is well ventilated to the outside and is not enclosed on more than two sides.

(ii) Containers shall be set upon firm foundation or otherwise firmly secured; the possible effect on the outlet piping of settling shall be guarded against by a flexible connection or special fitting.

(5) *Containers and equipment used inside of buildings or structures.* (i) When operational requirements make portable use of containers necessary and their location outside of buildings or structure is impracticable, containers and equipment are permitted to be used inside of buildings or structures in accordance with (*a*) through (*l*) of this subdivision, and, in addition, such other provisions of this subparagraph as are applicable to the particular use or occupancy.

(*a*) Containers in use shall mean connected for use.

(*b*) Systems utilizing containers having a water capacity greater than 2½ pounds (nominal 1 pound LP-Gas capacity) shall be equipped with excess flow valves. Such excess flow valves shall be either integral with the container valves or in the connections to the container valve outlets. In either case, an excess flow valve shall be installed in such a manner that any undue strain beyond the excess flow valve will not cause breakage between the container and the excess flow valve. The installation of excess flow valves shall take into account the type of valve protection provided.

(*c*) Regulators, if used, shall be either directly connected to the container valves or to manifolds connected to the container values. The regulator shall be suitable for use with LP-Gas. Manifolds and fittings connecting containers to pressure regulator inlets shall be designed for at least 250 p.s.i.g. service pressure.

(*d*) Valves on containers having a water capacity greater than 50 pounds (nominal 20 pounds LP-Gas capacity) shall be protected while in use.

(*e*) Containers shall be marked in accordance with paragraph (b) (5) (iii) of this section and subparagraph (2) of this paragraph.

(*f*) Pipe or tubing shall conform to paragraph (b) (8) of this section except that aluminum pipe or tubing shall not be used.

(*g*) (*1*) Hose shall be designed for a working pressure of at least 250 p.s.i.g. Hose and hose connections shall have their correctness as to design, construction and performance determined by listing by Underwriters Laboratories, Inc., or Factory Mutual Engineering Corp. The hose length may exceed the length specified in paragraph (b) (9) (vii) (*b*) of this section, but shall be as short as practicable.

(*2*) Hose shall be long enough to permit compliance with spacing provisions of this subparagraph without kinking or straining or causing hose to be so close to a burner as to be damaged by heat.

(*h*) Portable heaters, including salamanders, shall be equipped with an approved automatic device to shut off the flow of gas to the main burner, and pilot if used, in the event of flame extinguishment. Such heaters having inputs above 50,000 B.t.u. manufactured on or after May 17, 1967, and such heaters having inputs above 100,000 B.t.u. manufactured before May 17, 1967, shall be equipped with either.

(*1*) A pilot which must be lighted and proved before the main burner can be turned on; or

(*2*) An electric ignition system.

The provisions of this subdivision (*h*) do not apply to tar kettle burners, torches, melting pots, nor do they apply to portable heaters under 7,500 B.t.u.h. input when used with containers having a maximum water capacity of 2½ pounds. Container valves, connectors, regulators, manifolds, piping, and tubing shall not be used as structural supports for heaters.

(*i*) Containers, regulating equipment, manifolds, pipe, tubing, and hose shall be located so as to minimize exposure to abnormally high temperatures (such as may result from exposure to convection or radiation from heating equipment or installation in confined spaces), physical damage, or tampering by unauthorized persons.

(*j*) Heat producing equipment shall be located and used so as to minimize the possibility of ignition of combustibles.

(*k*) Containers having a water capacity greater than 2½ pounds (nominal 1 pound LP-Gas capacity) connected for use, shall stand on a firm and substantially level surface and, when necessary, shall be secured in an upright position.

(*l*) Containers, including the valve protective devices, shall be installed so as to minimize the probability of impingement of discharge of safety relief devices upon containers.

(ii) Containers having a maximum water capacity of 2½ pounds (nominal 1 pound LP-Gas capacity) are permitted to be used inside of buildings as part of approved self-contained hand torch assemblies or similar appliances.

(iii) Containers having a maximum water capacity of 12 pounds (nominal 5 pounds LP-Gas capacity) are permitted to be used temporarily inside of buildings for public exhibition or demonstration purposes, including use for classroom demonstrations.

(iv) (*a*) When buildings frequented by the public are open to the public, containers are permitted to be used for repair or minor renovation as follows:

(*1*) The maximum water capacity of individual containers shall be 50 pounds (nominal 20 pounds LP-Gas capacity).

(*2*) The number of LP-Gas containers shall not exceed the number of workmen assigned to using the LP-Gas.

(*3*) Containers having a water capacity greater than 2½ pounds (nominal 1 pound LP-Gas capacity) shall not be left unattended in such buildings.

(*b*) When buildings frequented by the public are not open to the public, containers are permitted to be used for repair or minor renovations, as follows:

The provisions of subdivision (v) of this subparagraph shall apply except that containers having a water capacity greater than 2½ pounds (nominal 1 pound LP-Gas capacity) shall not be left unattended in such buildings.

(v) Containers are permitted to be used in buildings or structures under construction or undergoing major renovation when such buildings or structures are not occupied by the public, as follows:

(*a*) The maximum water capacity of individual containers shall be 245 pounds (nominal 100 pounds LP-Gas capacity).

(*b*) For temporary heating such as curing concrete, drying plaster and similar applications, heaters (other than integral heater-container units) shall be located at least 6 feet from any LP-Gas container. This shall not prohibit the use of heaters specifically designed for attachment to the container or to a supporting standard, provided they are designed and installed so as to prevent direct or radiant heat application from the heater onto the container. Blower and radiant type heaters shall not be directed toward any LP-Gas container within 20 feet.

(*c*) If two or more heater-container units, of either the integral or nonintegral type, are located in an unpartitioned area on the same floor, the container or containers of each unit shall be separated from the container or containers of any other unit by at least 20 feet.

(*d*) When heaters are connected to containers for use in an unpartitioned area on the same floor, the total water capacity of containers manifolded together for connection to a heater or heaters shall not be greater than 735 pounds (nominal 300 pounds LP-Gas capacity). Such manifolds shall be separated by at least 20 feet.

(*e*) On floors on which heaters are not connected for use, containers are permitted to be manifolded together for connection to a heater or heaters on another floor, *Provided*:

(*1*) The total water capacity of containers connected to any one manifold is not greater than 2,450 pounds (nominal 1,000 pounds LP-Gas capacity) and;

(*2*) Where more than one manifold having a total water capacity greater than 735 pounds (nominal 300 pounds LP-Gas capacity) are located in the same unpartitioned area, they shall be separated by at least 50 feet.

(*f*) Storage of containers awaiting use shall be in accordance with paragraph (f) of this section.

(vi) Containers are permitted to be used in industrial occupancies for processing, research, or experimental purposes as follows:

(*a*) The maximum water capacity of individual containers shall be 245 pounds (nominal 100 pounds LP-Gas capacity).

(*b*) Containers connected to a manifold shall have a total water capacity not greater than 735 pounds (nominal 300 pounds LP-Gas capacity) and not more than one such manifold may be located in the same room unless separated at least 20 feet from a similar unit.

(*c*) The amount of LP-Gas in containers for research and experimental use shall be limited to the smallest practical quantity.

(vii) (*a*) Containers are permitted to be used in industrial occupancies with essentially noncombustible contents where portable equipment for space heating is essential and where a permanent heating installation is not practical, as follows:

(*b*) Containers and heaters shall comply with and be used in accordance with subdivision (v) of this subparagraph.

(viii) Containers are permitted to be used in buildings for temporary emergency heating purposes, if necessary to prevent damage to the buildings or contents, when the permanent heating system is temporarily out of service, as follows:

(*a*) Containers and heaters shall comply with and be used in accordance with subdivision (v) of this subparagraph.

(*b*) The temporary heating equipment shall not be left unattended.

(ix) Containers are permitted to be used temporarily in buildings for training purposes related in installation and use of LP-gas systems, as follows:

(*a*) The maximum water capacity of individual containers shall be 245 pounds (nominal 100 pounds LP-Gas capacity), but the maximum quantity of LP-Gas that may be placed in each container shall be 20 pounds.

(*b*) If more than one such container is located in the same room, the containers shall be separated by at least 20 feet.

(*c*) Containers shall be removed from the building when the training class has terminated.

(6) *Container valves and accessories.* (i) Valves in the assembly of multiple container systems shall be arranged so that replacement of containers can be made without shutting off the flow of gas in the system.

NOTE: This provision is not to be construed as requiring an automatic changeover device.

(ii) Regulators and low-pressure relief devices shall be rigidly attached to the cylinder valves, cylinders, supporting standards, the building walls or otherwise rigidly secured and shall be so installed or protected that the elements (sleet, snow, or ice) will not affect their operation.

(iii) Valves and connections to the containers shall be protected while in transit, in storage, and while being moved into final utilization, as follows:

(*a*) By setting into the recess of the container to prevent the possibility of their being struck if the container is dropped upon a flat surface, or

(*b*) By ventilated cap or collar, fastened to the container capable of withstanding a blow from any direction equivalent to that of a 30-pound weight dropped 4 feet. Construction must be such that a blow will not be transmitted to the valve or other connection.

(iv) When containers are not connected to the system, the outlet valves shall be kept tightly closed or plugged, even though containers are considered empty.

(v) Containers having a water capacity in excess of 50 pounds (approximately 21 pounds LP-Gas capacity), recharged at the installation, shall be provided with excess flow or backflow check valves to prevent the discharge of container contents in case of failure of the filling or equalizing connection.

(7) *Safety devices.* (i) Containers shall be provided with safety devices as required by DOT regulations.

(ii) A final stage regulator of an LP-Gas system (excluding any appliance regulator) shall be equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H-30.

TABLE H-30

Regulator delivery pressure	Relief valve start-to-discharge pressure setting (percent of regulator delivery pressure)	
	Minimum	Maximum
1 p.s.i.g. or less	200	300
Above 1 p.s.i.g. but not over 3 p.s.i.g	140	200
Above 3 p.s.i.g	125	200

(iii) When a regulator or pressure relief valve is used inside a building for other than purposes specified in paragraph (b)(6)(i) (*a*)-(*g*) of this section, the relief valve and the space above the regulator and relief valve diaphragms shall be vented to the outside air with the discharge outlet located not less than 3 feet horizontally away from any building opening which is below such discharge. These provisions do not apply to individual appliance regulators when protection is otherwise provided nor to subparagraph (5) of this paragraph and paragraph (b)(10)(xiii) of this section. In buildings devoted exclusively to gas distribution purposes, the space above the diaphragm need not be vented to the outside.

(8) *Reinstallation of containers.* Containers shall not be reinstalled unless they are requalified in accordance with DOT regulations.

(9) *Permissible product.* A product shall not be placed in a container marked with a service pressure less than four-fifths of the maximum vapor pressure of product at 130° F.

(d) *Systems utilizing containers other than DOT containers.*

(1) *Application.* This paragraph applies specifically to systems utilizing storage containers other than those constructed in accordance with DOT specifications. Paragraph (b) of this section applies to this paragraph unless otherwise noted in paragraph (b) of this section.

(2) *Design pressure and classification of storage containers.* Storage containers shall be designed and classified in accordance with Table H-31.

TABLE H-31

Container type	For gases with vapor press. Not to exceed lb. per sq. in. gage at 100° F. (37.8° C.)	Minimum design pressure of container, lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of ASME Code: All editions of API-ASME Code[3]
[1] 80	[1] 80	[1] 80	[1] 100
100	100	100	125
125	125	125	156
150	150	150	187
175	175	175	219
[2] 200	215	200	250

[1] New storage containers of the 80 type have not been authorized since Dec. 31, 1947.

[2] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) the 1949 ASME Code (Par. U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[3] Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

(3) *Container valves and accessories, filler pipes, and discharge pipes.* (i) The filling pipe inlet terminal shall not be located inside a building. For containers with a water capacity of 125 gallons or more, such terminals shall be located not less than 10 feet from any building (see paragraph (b)(6)(ii) of this section), and preferably not less than 5 feet from any driveway, and shall be located in a protective housing built for the purpose.

(ii) The filling connection shall be fitted with one of the following:

(*a*) Combination back-pressure check valve and excess flow valve.

(*b*) One double or two single back-pressure check valves.

(*c*) A positive shutoff valve, in conjunction with either:

(*1*) An internal back pressure valve, or

(*2*) An internal excess flow valve.

(iii) All openings in a container shall be equipped with approved automatic excess flow valves except in the following: filling connections as provided in subdivision (ii) of this subparagraph; safety relief connections, liquid-level gaging devices as provided in paragraphs (b)(7)(iv), (19)(iii), and (19)(viii) of this section; pressure gage connections as provided in paragraph (b)(7)(v) of this section, as provided in subdivisions (iv), (vi), and (vii) of this subparagraph.

(iv) An excess flow valve is not required in the withdrawal service line providing the following are complied with:

(*a*) Such systems' total water capacity does not exceed 2,000 U.S. gallons.

(*b*) The discharge from the service outlet is controlled by a suitable manually operated shutoff valve which is:

(*1*) Threaded directly into the service outlet of the container; or

(*2*) Is an integral part of a substantial fitting threaded into or on the service outlet of the container; or

(*3*) Threaded directly into a substantial fitting threaded into or on the service outlet of the container.

(*c*) The shutoff valve is equipped with an attached handwheel or the equivalent.

(*d*) The controlling orifice between the contents of the container and the outlet of the shutoff valve does not exceed five-sixteenths inch in diameter for vapor withdrawal systems and one-eighth inch in diameter for liquid withdrawal systems.

(*e*) An approved pressure-reducing regulator is directly attached to the outlet of the shutoff valve and is rigidly supported, or that an approved pressure-reducing regulator is attached to the outlet of the shutoff valve by means of a suitable flexible connection, provided the regulator is adequately supported and properly protected on or at the tank.

(v) All inlet and outlet connections except safety relief valves, liquid level gaging devices and pressure gages on containers of 2,000 gallons water capacity, or more, and on any container used to supply fuel directly to an internal combustion engine, shall be labeled to designate whether they communicate with vapor or liquid space. Labels may be on valves.

(vi) In lieu of an excess flow valve openings may be fitted with a quick-closing internal valve which, except during operating periods shall remain closed. The internal mechanism for such valves may be provided with a secondary control which shall be equipped with a fusible plug (not over 220° F. melting point) which will cause the internal valve to close automatically in case of fire.

(vii) Not more than two plugged openings shall be permitted on a container of 2,000 gallons or less water capacity.

(viii) Containers of 125 gallons water capacity or more manufactured after July 1, 1961, shall be provided with an approved device for liquid evacuation, the size of which shall be three-fourths inch National Pipe Thread minimum. A plugged opening will not satisfy this requirement.

(4) *Safety devices.* (i) All safety devices shall comply with the following:

(*a*) All container safety relief devices shall be located on the containers and shall have direct communication with the vapor of space of the container.

(*b*) In industrial and gas manufacturing plants, discharge pipe from safety relief valves on pipe lines within a building shall discharge vertically upward and shall be piped to a point outside a building.

(*c*) Safety relief device discharge terminals shall be so located as to provide protection against physical damage and such discharge pipes shall be fitted with loose raincaps. Return bends and restrictive pipefittings shall not be permitted.

(*d*) If desired, discharge lines from two or more safety relief devices located on the same unit, or similar lines from two or more different units, may be run into a common discharge header, provided that the cross-sectional area of such header be at least equal to the sum of the cross-sectional area of the individual discharge lines, and that the setting of safety relief valves are the same.

(*e*) Each storage container of over 2,000 gallons water capacity shall be provided with a suitable pressure gage.

(*f*) A final stage regulator of an LP-Gas system (excluding any appliance regulator) shall be equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H–30.

(*g*) When a regulator or pressure relief valve is installed inside a building, the relief valve and the space above the regulator and relief valve diaphragms shall be vented to the outside air with the discharge outlet located not less than 3 feet horizontally away from any opening into the building which is below such discharge. (These provisions do not apply to individual appliance regulators when protection is otherwise provided. In buildings devoted exclusively to gas distribution purposes, the space above the diaphragm need not be vented to the outside.)

(ii) Safety devices for aboveground containers shall be provided as follows:

(*a*) Containers of 1,200 gallons water capacity or less which may contain liquid fuel when installed above ground shall have the rate of discharge required by paragraph (b)(10)(ii) of this section provided by a spring-loaded relief valve or valves. In addition to the required spring-loaded relief valve(s), suitable fuse plug(s) may be used provided the total discharge area of the fuse plug(s) for each container does not exceed 0.25 square inch.

(*b*) The fusible metal of the fuse plugs shall have a yield temperature of 208° F. minimum and 220° F. maximum. Relief valves and fuse plugs shall have direct communication with the vapor space of the container.

(*c*) On a container having a water capacity greater than 125 gallons, but not over 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. Suitable provision shall be made for draining condensate which may accumulate in the relief valve or its discharge pipe.

(*d*) On containers of 125 gallons water capacity or less, the discharge from safety relief devices shall be located not less than 5 feet horizontally away from any opening into the building below the level of such discharge.

(*e*) On a container having a water capacity greater than 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards to a point at least 7 feet above the container, and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. Suitable provision shall be made so that any liquid or condensate that may accumulate inside of the safety relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, a means shall be provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of product escaping from the drain.

(iii) On all containers which are installed underground and which contain no liquid fuel until buried and covered, the rate of discharge of the spring-loaded relief valve installed thereon may be reduced to a minimum of 30 percent of the rate of discharge specified in paragraph (b)(10)(ii) of this section. Containers so protected shall not be uncovered after installation until the liquid fuel has been removed therefrom. Containers which may contain liquid fuel before being installed under ground and before being completely covered with earth are to be considered aboveground containers when determining the rate of discharge requirement of the relief valves.

(iv) On underground containers of more than 2,000 gallons water capacity, the discharge from safety relief devices shall be piped vertically and directly upward to a point at least 7 feet above the ground.

Where there is a probability of the manhole or housing becoming flooded, the discharge from regulator vent lines shall be above the highest probable water level. All manholes or housings shall be provided with ventilated louvers or their equivalent, the area of such openings equaling or exceeding the combined discharge areas of the safety relief valves and other vent lines which discharge their content into the manhole housing.

(v) Safety devices for vaporizers shall be provided as follows:

(*a*) Vaporizers of less than 1 quart total capacity, heated by the ground or the surrounding air, need not be equipped with safety relief valves provided that adequate tests certified by any of the authorities referred to in paragraph (b)(2) of this section, demonstrate that the assembly is safe without safety relief valves.

(*b*) No vaporizer shall be equipped with fusible plugs.

(*c*) In industrial and gas manufacturing plants, safety relief valves on vaporizers within a building shall be piped to a point outside the building and be discharged upward.

(5) *Reinstallation of containers.* Containers may be reinstalled if they do not show any evidence of harmful external corrosion or other damage. Where containers are reinstalled underground, the corrosion resistant coating shall be put in good condition (see subparagraph (7)(vi) of this paragraph). Where containers are reinstalled above ground, the safety devices and gaging devices shall comply with subparagraph (4) of this paragraph and paragraph (b)(19) of this section respectively for aboveground containers.

(6) *Capacity of containers.* A storage container shall not exceed 90,000 gallons water capacity.

(7) *Installation of storage containers.* (i) Containers installed above ground, except as provided in subdivision (vii) of this subparagraph, shall be provided with substantial masonry or noncombustile structural supports on firm masonry foundation.

(ii) Aboveground containers shall be supported as follows:

(*a*) Horizontal containers shall be mounted on saddles in such a manner as to permit expansion and contraction. Structural metal supports may be employed when they are protected against fire in an approved manner. Suitable means of preventing corrosion shall be provided on that portion of the container in contact with the foundations or saddles.

(*b*) Containers of 2,000 gallons water capacity or less may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container shell to the concrete pad, footing, or the ground does not exceed 24 inches.

(iii) Any container may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container to the ground does not exceed 5 feet, provided the container is in an isolated location.

(iv) Containers may be partially buried providing the following requirements are met:

(*a*) The portion of the container below the surface and for a vertical distance not less than 3 inches above the surface of the ground is protected to resist corrosion, and the container is protected against settling and corrosion as required for fully buried containers.

(*b*) Spacing requirements shall be as specified for underground tanks in paragraph (b)(6)(ii) of this section.

(*c*) Relief valve capacity shall be as required for aboveground containers.

(*d*) Container is located so as not to be subject to vehicular damage, or is adequately protected against such damage.

(*e*) Filling densities shall be as required for above-ground containers.

(v) Containers buried underground shall be placed so that the top of the container is not less than 6 inches below grade. Where an underground container might be subject to abrasive action or physical damage due to vehicular traffic or other causes, then it shall be:

(*a*) Placed not less than 2 feet below grade, or

(*b*) Otherwise protected against such physical damage.

It will not be necessary to cover the portion of the container to which manhole and other connections are affixed; however, where necessary, protection shall be provided against vehicular damage. When necessary to prevent floating, containers shall be securely anchored or weighted.

(vi) (*a*) Containers shall be given a protective coating before being placed under ground. This coating shall be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. In lowering the container into place, care shall be exercised to prevent damage to the coating. Any damage to the coating shall be repaired before backfilling.

(*b*) Containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.

(vii) Containers with foundations attached (portable or semiportable containers with suitable steel "runners" or "skids" and popularly known in the industry as "skid tanks") shall be designed, installed, and used in accordance with these rules subject to the following provisions:

(*a*) If they are to be used at a given general location for a temporary period not to exceed 6 months they need not have fire-resisting foundations or saddles but shall have adequate ferrous metal supports.

(*b*) They shall not be located with the outside bottom of the container shell more than 5 feet above the surface of the ground unless fire-resisting supports are provided.

(*c*) The bottom of the skids shall not be less than 2 inches or more than 12 inches below the outside bottom of the container shell.

(*d*) Flanges, nozzles, valves, fittings, and the like, having communication with the interior of the container, shall be protected against physical damage.

(*e*) When not permanently located on fire-resisting foundations, piping connections shall be sufficiently flexible to minimize the possibility of breakage or leakage of connections if the container settles, moves, or is otherwise displaced.

(*f*) Skids, or lugs for attachment of skids, shall be secured to the container in accordance with the code or rules under which the container is designed and built (with a minimum factor of safety of four) to withstand loading in any direction equal to four times the weight of the container and attachments when filled to the maximum permissible loaded weight.

(viii) Field welding where necessary shall be made only on saddle plates or brackets which were applied by the manufacturer of the tank.

(ix) For aboveground containers, secure anchorage or adequate pier height shall be provided against possible container flotation wherever sufficiently high floodwater might occur.

(x) When permanently installed containers are interconnected, provision shall be made to compensate for expansion, contraction, vibration, and settling of containers, and interconnecting piping. Where flexible connections are used, they shall be of an approved type and shall be designed for a bursting pressure of not less than five times the vapor pressure of the product at 100° F. The use of nonmetallic hose is prohibited for permanently interconnecting such containers.

(xi) Container assemblies listed for interchangeable installation above ground or under ground shall conform to the requirements for aboveground installations with respect to safety relief capacity and filling density. For installation above ground all other requirements for aboveground installations shall apply. For installation under ground all other requirements for underground installations shall apply.

(8) *Protection of container accessories.* (i) Valves, regulating, gaging, and other container accessory equipment shall be protected against tampering and physical damage. Such accessories shall also be so protected during the transit of containers intended for installation underground.

(ii) On underground or combination aboveground-underground containers, the service valve handwheel, the terminal for connecting the hose, and the opening through which there can be a flow from safety relief valves shall be at least 4 inches above the container and this opening shall be located in the dome or housing. Underground systems shall be so installed that all the above openings, including the regulator vent, are located above the normal maximum water table.

(iii) All connections to underground containers shall be located within a substantial dome, housing, or manhole and with access thereto protected by a substantial cover.

(9) *Drips for condensed gas.* Where vaporized gas on the low-pressure side of the system may condense to a liquid at normal operating temperatures and pressures, suitable means shall be provided for revaporization of the condensate.

(10) *Damage from vehicles.* When damage to LP-Gas systems from vehicular traffic is a possibility, precautions against such damage shall be taken.

(11) *Pits and drains.* Every effort should be made to avoid the use of pits, except pits fitted with automatic flammable vapor detecting devices. No drains or blowoff lines shall be directed into or in proximity to sewer systems used for other purposes.

(12) *General provisions applicable to systems in industrial plants (of 2,000 gallons water capacity and more) and to bulk filling plants.* (i) When standard watch service is provided, it shall be ex-

tended to the LP-Gas installation and personnel properly trained.

(ii) If loading and unloading are normally done during other than daylight hours, adequate lights shall be provided to illuminate storage containers, control valves, and other equipment.

(iii) Suitable roadways or means of access for extinguishing equipment such as wheeled extinguishers or fire department apparatus shall be provided.

(iv) To minimize trespassing or tampering, the area which includes container appurtenances, pumping equipment, loading and unloading facilities, and cylinder-filling facilities shall be enclosed with at least a 6-foot-high industrial type fence unless otherwise adequately protected. There shall be at least two means of emergency access.

(13) *Container-charging plants.* (i) The container-charging room shall be located not less than:

(*a*) Ten feet from bulk storage containers.

(*b*) Twenty-five feet from line of adjoining property which may be built upon.

(ii) Tank truck filling station outlets shall be located not less than:

(*a*) Twenty-five feet from line of adjoining property which may be built upon.

(*b*) Ten feet from pumps and compressors if housed in one or more separate buildings.

(iii) The pumps or compressors may be located in the container-charging room or building, in a separate building, or outside of buildings. When housed in a separate building, such building (a small noncombustible weather cover is not to be construed as a building) shall be located not less than:

(*a*) Ten feet from bulk storage tanks.

(*b*) Twenty-five feet from line of adjoining property which may be built upon.

(*c*) Twenty-five feet from sources of ignition.

(iv) When a part of the container-charging building is to be used for a boiler room or where open flames or similar sources of ignition exist or are employed, the space to be so occupied shall be separated from container charging room by a partition wall or walls of fire-resistant construction continuous from floor to roof or ceiling. Such separation walls shall be without openings and shall be joined to the floor, other walls, and ceiling or roof in a manner to effect a permanent gas-tight joint.

(v) Electrical equipment and installations shall conform with paragraphs (b) (17) and (18) of this section.

(14) *Fire protection.* (i) Each bulk plant shall be provided with at least one approved portable fire extinguisher having a minimum rating of 12–B, C.

(ii) In industrial installations involving containers of 150,000 gallons aggregate water capacity or more, provision shall be made for an adequate supply of water at the container site for fire protection in the container area, unless other adequate means for fire control are provided. Water hydrants shall be readily accessible and so spaced as to provide water protection for all containers. Sufficient lengths of firehose shall be provided at each hydrant location on a hose cart, or other means provided to facilitate easy movement of the hose in the container area. It is desirable to equip the outlet of each hose line with a combination fog nozzle. A shelter shall be provided to protect the hose and its conveyor from the weather.

(15) *Painting.* Aboveground containers shall be kept properly painted.

(16) *Lighting.* Electrical equipment and installations shall conform to paragraphs (b) (17) and (18) of this section.

(17) *Vaporizers for internal combustion engines.* The provisions of paragraph (e) (8) of this section shall apply.

(18) *Gas regulating and mixing equipment for internal combustion engines.* The provisions of paragraph (e) (9) of this section shall apply.

(e) *Liquefied petroleum gas as a motor fuel*—(1) *Application.* (i) This paragraph applies to internal combustion engines, fuel containers, and pertinent equipment for the use of liquefied petroleum gases as a motor fuel on easily movable, readily portable units including self-propelled vehicles.

(ii) Fuel containers and pertinent equipment for internal combustion engines using liquefied petroleum gas where installation is of the stationary type are covered by paragraph (d) of this section. This paragraph does not apply to containers for transportation of liquefied petroleum gases nor to marine fuel use. All requirements of paragraph (b) of this section apply to this paragraph, unless otherwise noted in paragraph (b) of this section.

(2) *General.* (i) Fuel may be used from the cargo tank of a truck while in transit, but not from cargo tanks on trailers or semitrailers. The use of fuel from the cargo tanks to operate stationary engines is permitted providing wheels are securely blocked.

(ii) Passenger-carrying vehicles shall not be fueled while passengers are on board.

(iii) Industrial trucks (including lift trucks) equipped with permanently mounted fuel containers shall be charged outdoors. Charging equipment shall comply with the provisions of paragraph (h) of this section.

(iv) LP-Gas fueled industrial trucks shall comply with the Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks, NFPA 505–1969.

(v) Engines on vehicles shall be shut down while fueling if the fueling operation involves venting to the atmosphere.

(3) *Design pressure and classification of fuel containers.* (i) Except as covered in subdivisions (ii) and (iii) of this subparagraph, containers shall be in accordance with Table H–32.

(ii) Fuel containers for use in industrial trucks (including lift trucks) shall be either DOT containers authorized for LP-Gas service having a minimum service pressure of 240 p.s.i.g. or minimum Container Type 250. Under 1950 and later ASME codes, this means a 312.5-p.s.i.g. design pressure container.

TABLE H-32

Container type	For gases with vapor press. not to exceed lb. per sq. in. gage at 100° F. (37.8 C.)	Minimum design pressure of container lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U–68, U–69)	1949 edition of ASME Code (Par. U–200, U–201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of ASME Code; All editions of API-ASME Code[2]
[1] 200	215	200	250

[1] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U–68 and U–69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) the 1949 ASME Code (Par. U–200 and U–201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division I) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[2] Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

(iii) Containers manufactured and maintained under DOT specifications and regulations may be used as fuel containers. When so used they shall conform to all requirements of this paragraph.

(iv) All container inlets and outlets except safety relief valves and gaging devices shall be labeled to designate whether they communicate with vapor or liquid space. Labels may be on valves.

(4) *Installation of fuel containers.* (i) Containers shall be located in a place and in a manner to minimized the possibility of damage to the container. Containers located in the rear of trucks and buses, when protected by substantial bumpers, will be considered in conformance with this requirement. Fuel containers on passenger-carrying vehicles shall be installed as far from the engine as is practicable, and the passenger space and any space containing radio equipment shall be sealed from the container space to prevent direct seepage of gas to these spaces. The container compartment shall be vented to the outside. In case the fuel container is mounted near the engine or the exhaust system, the container shall be shielded against direct heat radiation.

(ii) Containers shall be installed with as much clearance as practicable but never less than the minimum road clearance of the vehicle under maximum spring deflection. This minimum clearance shall be to the bottom of the container or to the lowest fitting on the container or housing, whichever is lower.

(iii) Permanent and removable fuel containers shall be securely mounted to prevent jarring loose, slipping, or rotating, and the fastenings shall be designed and constructed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with fuel using a safety factor of not less than four based on the ultimate strength of the material to be used. Field welding, when necessary, shall be made only on saddle plates, lugs or brackets, originally attached to the container by the tank manufacturer.

(iv) Fuel containers on buses shall be permanently installed.

(v) Containers from which vapor only is to be withdrawn shall be installed and equipped with suitable connections to minimize the accidental withdrawal of liquid.

(5) *Valves and accessories.* (i) Container valves and accessories shall have a rated working pressure of at least 250 p.s.i.g., and shall be of a type suitable for liquefied petroleum gas service.

(ii) The filling connection shall be fitted with an approved double back-pressure check valve, or a positive shutoff in conjunction with an internal back-pressure check valve. On a removable container the filler valve may be a hand operated shutoff valve with an internal excess flow valve. Main shutoff valves on the container on liquid and vapor lines must be readily accessible.

(iii) With the exceptions of subdivision (iv) (*c*) of this subparagraph, filling connections equipped with approved automatic back-pressure check valves, and safety relief valves, all connections to containers having openings for the flow of gas in excess of a No. 54 drill size shall be equipped with approved automatic excess flow valves to prevent discharge of content in case connections are broken.

(iv) Liquid-level gaging devices:

(*a*) Variable liquid-level gages which require the venting of fuel to the atmosphere shall not be used on fuel containers of industrial trucks (including lift trucks).

(*b*) On portable containers that may be filled in the vertical and/or horizontal position, the fixed liquid-level gage must indicate maximum permitted filling level for both vertical and horizontal filling with the container oriented to place the safety relief valve in communication with the vapor space.

(*c*) In the case of containers used solely in farm tractor service, and charged at a point at least 50 feet from any important building, the fixed liquid-level gaging device may be so constructed that the outward flow of container content exceeds that passed by a No. 54 drill size opening, but in no case shall the flow exceed that passed by a No. 31 drill-size opening. An excess flow valve is not required. Fittings equipped with such restricted drill size opening and container on which they are used shall be marked to indicate the size of the opening.

(*d*) All valves and connections on containers shall be adequately protected to prevent damage due to accidental contact with stationary objects or from loose objects thrown up from the road, and all valves shall be safeguarded against damage due to collision, overturning or other accident. For farm tractors where parts of the vehicle provide such protection to valves and fittings, the foregoing requirements shall be considered fulfilled. However, on removable type containers the protection for the fittings shall be permanently attached to the container.

(*e*) Exchange of removable fuel containers preferably should be done outdoors but may be done indoors. When removable fuel containers are used, means shall be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This may be accomplished by either of the following methods:

(*1*) Using an approved automatic quick-closing coupling (a type closing in both directions when uncoupled) in the fuel line, or

(*2*) Closing the valve at the fuel container and allowing the engine to run until the fuel in the line is consumed.

(6) *Piping—including pipe, tubing, and fittings.* (i) Pipe from fuel container to first-stage regulator shall be not less than schedule 80 wrought iron or steel (black or galvanized), brass or copper; or seamless copper, brass, or steel tubing. Steel tubing shall have a minimum wall thickness of 0.049 inch. Steel pipe or tubing shall be adequately protected against exterior corrosion. Copper tubing shall be types K or L or equivalent having a minimum wall thickness of 0.032 inch. Approved flexible connections may be used between container and regulator or between regulator and gas-air mixer within the limits of approval. The use of aluminum pipe or tubing is prohibited. In the case of removable containers an approved flexible connection shall be used between the container and the fuel line.

(ii) All piping shall be installed, braced, and supported so as to reduce to a minimum the possibility of vibration strains or wear.

(7) *Safety devices.* (i) Spring-loaded internal type safety relief valves shall be used on all motor fuel containers.

(ii) The discharge outlet from safety relief valves shall be located on the outside of enclosed spaces and as far as practicable from possible sources of ignition, and vented upward within 45 degrees of the vertical in such a manner as to prevent impingement of escaping gas upon containers, or parts of vehicles, or on vehicles in adjacent lines of traffic. A rain cap or other protector shall be used to keep water and dirt from collecting in the valve.

(iii) When a discharge line from the container safety relief valve is used, the line shall be metallic, other than aluminum, and shall be sized, located, and maintained so as not to restrict the required flow of gas from the safety relief valve. Such discharge line shall be able to withstand the pressure resulting from the discharge of vapor when the safety relief valve is in the full open position. When flexibility is necessary, flexible metal hose or tubing shall be used.

(iv) Portable containers equipped for volumetric filling may be filled in either the vertical or horizontal position only when oriented to place the safety relief valve in communication with the vapor space.

(v) Paragraph (b)(10)(xii) of this section for hydrostatic relief valves shall apply.

(8) *Vaporizers.* (i) Vaporizers and any part thereof and other devices that may be subjected to container pressure shall have a design pressure of at least 250 p.s.i.g.

(ii) Each vaporizer shall have a valve or suitable plug which will permit substantially complete draining of the vaporizer. It shall be located at or near the lowest portion of the section occupied by the water or other heating medium.

(iii) Vaporizers shall be securely fastened so as to minimize the possibility of becoming loosened.

(iv) Each vaporizer shall be permanently marked at a visible point as follows:

(*a*) With the design pressure of the fuel-containing portion in p.s.i.g.

(*b*) With the water capacity of the fuel-containing portion of the vaporizer in pounds.

(v) Devices to supply heat directly to a fuel container shall be equipped with an automatic device to cut off the supply of heat before the pressure inside the fuel container reaches 80 percent of the start to discharge pressure setting of the safety relief device on the fuel container.

(vi) Engine exhaust gases may be used as a direct source of heat supply for the vaporization of fuel if the materials of construction of those parts of the vaporizer in contact with exhaust gases are resistant to the corrosive action of exhaust gases and the vaporizer system is designed to prevent excessive pressures.

(vii) Vaporizers shall not be equipped with fusible plugs.

(9) *Gas regulating and mixing equipment.* (i) Approved automatic pressure reducing equipment shall be installed in a secure manner between the fuel supply container and gas-air mixer for the purpose of reducing the pressure of the fuel delivered to the gas-air mixer.

(ii) An approved automatic shutoff valve shall be provided in the fuel system at some point ahead of the inlet of the gas-air mixer, designed to prevent flow of fuel to the mixer when the ignition is off and the engine is not running. In the case of industrial trucks and engines operating in buildings other than those used exclusively to house engines, the automatic shutoff valve shall be designed to operate if the engine should stop. Atmospheric type regulators (zero governors) shall be considered adequate as an automatic shutoff valve only in cases of outdoor operation such as farm tractors, construction equipment, irrigation pump engines, and other outdoor stationary engine installations.

(iii) The source of the air for combustion shall be completely isolated from the passenger compartment, ventilating system, or air-conditioning system.

(10) *Capacity of containers.* No single fuel container used on passenger carrying vehicles shall exceed 200 gallons water capacity. No single fuel container on other vehicles normally operating on the highway shall exceed 300 gallons water capacity except as provided in subparagraph (2)(i) of this paragraph.

(11) *Stationary engines in buildings.* Stationary engines and gas turbines installed in buildings, including portable engines used instead of or to supplement stationary engines, shall comply with the Standard for the Institution and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37–1970, and the appropriate provisions of paragraphs (b), (c), and (d) of this section.

(12) *Portable engines in buildings.* (i) Portable engines may be used in buildings only for emergency use, except as provided by subparagraph (11) of this paragraph.

(ii) Exhaust gases shall be discharged to outside the building or to an area where they will not constitute a hazard.

(iii) Provision shall be made to supply sufficient air for combustion and cooling.

(iv) An approved automatic shutoff valve shall be provided in the fuel system ahead of the engine, designed to prevent flow of fuel to the engine when the ignition is off or if the engine should stop.

(v) The capacity of LP-Gas containers used with such engines shall comply with the applicable occupancy provision of paragraph (c)(5) of this section.

(13) *Industrial trucks inside buildings.* (i) LP-Gas-fueled industrial trucks are permitted to be used in buildings and structures.

(ii) No more than two LP-Gas containers shall be used on an industrial truck for motor fuel purposes.

(iii) LP-Gas-fueled industrial trucks are permitted to be used in buildings frequented by the public, when occupied by the public. The total water capacity of containers on each industrial truck shall not exceed 105 pounds (nominal 45 pounds LP-Gas).

(iv) Trucks shall not be left unattended in areas occupied by the public.

(v) Industrial trucks shall not be parked and left unattended in areas of possible excessive heat or sources of ignition.

(14) *Garaging LP-Gas-fueled vehicles.* (i) LP-Gas-fueled vehicles may be stored or serviced inside garages provided there are no leaks in the fuel system and the fuel tanks are not filled beyond the maximum filling capacity specified in paragraph (b)(12)(i) of this section.

(ii) LP-Gas-fueled vehicles being repaired in garages shall have the container shutoff valve closed except when fuel is required for engine operation.

(iii) Such vehicles shall not be parked near sources of heat, open flames, or similar sources of ignition or near open pits unless such pits are adequately ventilated.

(f) *Storage of containers awaiting use or resale*—(1) *Application.* This paragraph shall apply to the storage of portable containers not in excess of 1,000 pounds water capacity, filled or partially filled, at user location but not connected for use, or in storage for resale by dealers or resellers. This paragraph shall not apply to containers stored at charging plants or at plants devoted primarily to the storage and distribution of LP–Gas or other petroleum products.

(2) *General.* (i) Containers in storage shall be located so as to minimize exposure to excessive temperature rise, physical damage, or tampering by unauthorized persons.

(ii) Containers when stored inside shall not be located near exits, stairways, or in areas normally used or intended for the safe exit of people.

(iii) Container valves shall be protected while in storage as follows:

(*a*) By setting into recess of container to prevent the possibility of their being struck if the container is dropped upon a flat surface, or

(*b*) By ventilated cap or collar, fastened to container capable of withstanding blow from any direction equivalent to that of a 30-pound weight dropped 4 feet. Construction must be such that a blow will not be transmitted to a valve or other connection.

(iv) The outlet valves of containers in storage shall be closed.

(v) Empty containers which have been in LP-Gas service should preferably be stored in the open. When stored inside, they shall be considered as full containers for the purpose of determining the maximum quantity of LP-Gas permitted by this paragraph.

(3) *Storage within buildings frequented by the public.* (i) DOT specification containers having a maximum individual water capacity of 2½ pounds, used with completely self-contained hand torches and similar applications, are permitted to be stored or displayed in a building frequented by the public. The display of such containers shall be limited to a total of 24 units of each brand and size. The total quantity on display and in storage shall not exceed 200 pounds LP-Gas.

(ii) Storage as provided in subparagraph (5) of this paragraph shall not be permitted within or attached to such a building.

(4) *Storage within buildings not frequented by the public (such as industrial buildings).* (i) The quantity of LP-Gas stored shall not exceed 300 pounds (approximately 2,550 cubic feet in vapor form) except as provided in subparagraph (5) of this paragraph.

(ii) Containers carried as a part of service equipment on highway mobile vehicles are not to be considered in the total storage capacity in subdivision (i) of this subparagraph provided such vehicles are stored in private garages, and are limited to one container per vehicle with an LP-Gas capacity of not more than 100 pounds. All container valves shall be closed.

(5) *Storage within special buildings or rooms.* (i) The quantity of LP-Gas stored in special buildings or rooms shall not exceed 10,000 pounds.

(ii) The walls, floors, and ceilings of container storage rooms that are within or adjacent to other parts of the building shall be constructed of material having at least a 2-hour fire resistance rating.

(iii) A portion of the exterior walls or roof having an area not less than 10 percent of that of the combined area of the enclosing walls and roof, shall be of single-strength glass or other similar explosion relieving construction.

(iv) Each opening from such storage rooms to other parts of the building shall be protected by a 1½ hour (B) fire door listed by Underwriters Laboratories Inc.

(v) Such rooms shall have no open flames for heating or lighting.

(vi) Such rooms shall be adequately ventilated both top and bottom to the outside only. The openings from such vents shall be at least 5 feet away from any other opening into any building.

(vii) The floors of such rooms shall not be below ground level. Any space below the floor shall be of solid fill or properly ventilated to the open air.

(viii) Such storage rooms shall not be located adjoining the line of property occupied by schools, churches, hospitals, athletic fields or other points of public gathering.

(ix) Fixed electrical equipment shall be installed in accordance with paragraph (b)(18) of this section.

(6) *Storage outside of buildings.* (i) Storage outside of buildings, for containers awaiting use or resale, shall be located in accordance with Table H-33 with respect to:

(*a*) the nearest important building or group of buildings;

(*b*) the line of adjoining property which may be built upon;

(*c*) busy thoroughfares;

(*d*) the line of adjoining property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering.

TABLE H-33

Quantity of LP-Gas Stored:	*Distance*
500 pounds or less	0
501 to 2,500 pounds	0*
2,501 to 6,000 pounds	10 feet
6,001 to 10,000 pounds	20 feet
Over 10,000 pounds	25 feet

*Container or containers shall be at least 10 feet from any building on adjoining property, any sidewalk, or any of the exposures described in § 1910.110(f)(6)(i) (*c*) or (*d*) of this paragraph.

(ii) Containers shall be in a suitable enclosure or otherwise protected against tampering.

(7) *Fire protection.* Storage locations other than supply depots separated and located apart from dealer, reseller, or user establishments shall be provided with at least one approved portable fire extinguisher having a minimum rating of 8–B, C.

(g) *LP-Gas system installations on commercial vehicles*—(1) *Application.* This paragraph applies to LP-Gas-system installations on vehicles (whether self-propelled or of the trailer or semitrailer type) used for commercial, construction, or public service purposes such as mobile libraries and clinics; to all exchangeable container systems with container capacities greater than 105 pounds water capacity (approximately 45 pounds LP-Gas capacity) and to systems using containers permanently mounted on vehicles. It does not apply to LP-Gas motor fuel systems covered by paragraph (e) of this section. Paragraph (b) of this section applies to this paragraph unless otherwise noted. When such a vehicle is permanently parked, and LP-Gas is supplied from a system not mounted on and secured to the unit, paragraphs (c) and (d) of this section shall apply.

(2) *Construction and marking of containers.* Containers shall be constructed

in accordance with paragraph (b)(3) of this section, and marked in accordance with the applicable requirements of paragraph (b)(5) of this section, and shall also meet the following:

(i) Containers designed for use as portable cylinders shall be constructed in accordance with DOT specifications, and in accordance with paragraph (b)(3)(v) of this section; where applicable.

(ii) All other containers whether designed for permanent mounting, or for portable or semiportable use (such as skid tanks), shall be constructed as provided for by paragraphs (b)(3) (i) and (iv) of this section. Mounting, securing, and protection of such containers shall be as in subdivisions (iii) and (iv) of this subparagraph.

(iii) Permanently installed containers shall meet the requirements of subdivision (*a*) of this subdivision with regard to container valves and accessories, and subdivision (*b*) of this subdivision as to mounting.

(*a*) (*1*) Nonrecessed container fittings and appurtenances shall be protected against damage by either:

(*i*) Their location.

(*ii*) The vehicle frame or bumper, or

(*iii*) A protective housing. The protective housing, if used, shall comply with the requirements under which the tanks are fabricated with respect to design and construction and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used. The housing shall be provided with a weather cover if necessary to insure proper operation of valves and safety devices.

(*2*) Manually operated shutoff valves, except as covered in paragraph (e)(2)(i) of this section, or self-closing internal valves shall be closed except during transfer operations.

(*b*) (*1*) Tank motor vehicles with frames not made integral with the tank, as by welding, shall be provided with turnbuckles or similar positive devices for drawing the tank down tight on the frame. In addition, suitable stops or anchors shall be attached to the frame and/or the tank to prevent relative motion between them due to starting, stopping, and turning. The stops and anchors shall be so installed as to be readily accessible for inspection and maintenance.

(*2*) Any tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the stress member used in lieu of a frame shall be supported by external cradles subtending at least 120 degrees of the shell circumference. The design calculations shall include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the cargo tank as a whole using a factor of safety of four, based on the ultimate tensile strength of the material. Maximum concentrated stresses which might be created at pads and cradles due to shear, bending, and torsion shall also be calculated in accordance with Appendix G of the American Society of Mechanical Engineers, Unfired Pressure Vessel Code, 1968. Fully loaded vehicles shall be assumed to be operating under highway conditions equal to two "g" loading. The effects of fatigue shall be taken into consideration. Cargo tanks mounted on frames may be supported by longitudinal members attached to pads providing the above-stated factors are taken into account.

(*3*) Where any tank support is attached to any part of a tank head, the stresses imposed upon the head shall be provided for as required in (2) of this subdivision.

(*4*) Tank supports, stops, anchors, and bumpers shall not be welded directly to the tank but shall be attached by means of pads of the same material as the tank. The pad thickness shall be not less than one-fourth inch, or the thickness of the shell material if less, and no greater than the shell material. Each pad shall extend at least four times its thickness, in each direction, beyond the weld attaching the support, bumper, stop, or anchor. Each pad shall be preformed to an inside radius no greater than the outside radius of the tank at the place of attachment. Each pad corner shall be rounded to a radius at least one-fourth the width of the pad, and no greater than one-half the width of the pad. Weepholes and telltale holes, if used, shall be drilled or punched before the pads are attached to the tank. Each pad shall be attached to the tank by continuous fillet welding using filler material having properties conforming to the recommendations of the maker of the shell and head material.

(iv) Portable or semiportable containers (skid tanks as covered by paragraph (d)(7)(vii) of this section) shall meet the applicable requirements of (*a*) to (*f*) of this subdivision inclusive with regard to container valves and accessories and paragraph (e)(4)(iii) of this section as to mounting. Containers designed for permanent installation as part of systems under paragraph (d) of this section shall not be used.

(*a*) Nonrecessed container fittings and appurtenances shall be protected against damage by either—

(*1*) Their location.

(*2*) The vehicle frame or bumper, or

(*3*) A protective housing. The protective housing, if used, shall comply with the requirements under which the tanks are fabricated with respect to design and construction and shall be designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used. The housing shall be provided with a weather cover if necessary to insure proper operation of valves and safety devices.

(*b*) Filling connections shall be provided with approved automatic back pressure check valves, excess flow check valves or quick closing internal valves to prevent excessive escape of gas in case the filling connection is broken, except that where the filling and discharge connect on a common opening in the container shell, and that opening is fitted with a quick-closing internal valve as specified in subdivision (*c*) of this subdivision, the automatic valve shall not be required. In addition every inlet and outlet connection shall be equipped with a manually or automatically operated shutoff valve. Liquid discharge openings, except those for engine fuel lines, on tanks built after September 1, 1965, shall be fitted with a remotely controlled internal shutoff valve. Such valve shall conform to the following requirements:

(*1*) The seat of the valve shall be inside the tank, or in the opening nozzle or flange, or in a companion flange bolted to the nozzle or flange.

(*2*) All parts of the valve inside the tank, nozzle, or companion flange shall be made of material not subject to corrosion or other deterioration in the presence of the lading.

(*3*) The arrangement of parts shall be such that damage to parts exterior to the tank will not prevent effective seating of the valve.

(*4*) The valve may be operated normally by mechanical means, by hydraulic means, or by air, or gas pressure.

(*5*) The valve shall be provided with remote means of automatic closure, both mechanical and thermal, in at least two places for tanks over 3,500 gallons water capacity. These remote control stations shall be located at each end of the tank and diagonally opposite each other. The thermal control mechanism shall have a fusible element with a melting point not over 220° F. or less than 208° F. At least one remote control station shall be provided for tanks of 3,500 gallons water capacity or less, and such actuating means may be mechanical.

(*c*) All other connections to containers, except those used for gaging devices, thermometer wells, safety relief devices, and plugged openings, shall be provided with suitable automatic excess flow valves, or in lieu thereof may be fitted with quick-closing internal valves.

The control mechanism for the internal valve shall be provided with a secondary control, remote from the fill or discharge connections (for use in the event of accidents or fire during delivery operations), and such control mechanism shall have a fusible element with a melting point not over 220° F. or less than 208° F.

(*d*) Manually operated shutoff valves, except as covered in paragraphs (e)(2)(i) of this section, or self-closing internal valves shall be closed except during transfer operations.

(*e*) Excess flow valves shall close automatically at the rated flow of vapor or liquid as specified by the valve manufacturers. The flow rating of the piping beyond the excess flow valve shall be greater than that of the excess flow valve and such rating shall include valves, fittings, and hose, except, when branching or necessary restrictions are incorporated in such a piping system so that flow ratings are less than that of the excess flow valve at the tank, then additional excess flow valves shall be installed in the piping where such flow rate is reduced.

(*f*) Container inlets and outlets, except those used for safety relief valves, liquid-level gaging devices, and pressure gages, shall be labeled to designate whether they communicate with vapor or liquid space when the container is filled to maximum permitted filling density. Labels may be on valves.

(3) *Capacity of a system.* No single fuel container used on passenger carrying vehicles shall exceed 200 gallons water capacity.

(4) *Description of a system.* A system consists of an assembly of equipment installed on a commercial vehicle.

(5) *Location of containers and systems.* (i) Containers shall not be installed, transported, or stored (even temporarily) inside any vehicle covered by this paragraph except as provided by the applicable regulations of DOT.

(ii) Containers, control valves, and regulating equipment comprising a complete system shall be suitably protected against damage and weather. Systems may be installed in a recess vaportight to the inside of the vehicle and accessible from and vented to the outside.

(iii) Systems installed outside of mobile units shall be so located that discharge from safety relief devices shall be not less than 3 feet horizontally away from any opening into the unit below the level of such discharge. When the system is located in a recess vaportight to the inside, vent openings in such recess shall be not less than 3 feet horizontally away from any opening into the mobile unit below the level of these vents.

(iv) There shall be no fuel connection between tractor and trailer or other vehicle units.

(v) The container or container carrier shall be secured in place by fastenings designed and constructed with a minimum safety factor of four to withstand loading in any direction equal to twice the weight of the container when filled to normal capacity with LP-Gas.

(6) *Container valves and accessories.* Container valves and accessories shall be provided, protected and mounted as follows:

(i) Systems utilizing DOT cylinders in accordance with paragraph (c)(6) of this section.

(ii) All other systems in accordance with paragraph (d)(3) (ii) through (vii) of this section.

(iii) Portable, semiportable and permanently mounted containers shall be mounted and protected as provided under subparagraph (2) (ii) through (iv) of this paragraph.

(7) *Safety-relief devices.* (i) DOT containers shall be provided with safety-relief devices as required by the regulations of DOT.

(ii) ASME containers and API-ASME containers shall be provided with safety-relief devices as required by paragraph (b)(10) of this section.

(iii) (*a*) A final stage regulator of an LP-Gas system (excluding any appliance regulator) shall be equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H-30.

(*b*) The relief valve and space above the regulator and relief valve diaphragms shall be vented to the outside air and terminate at a position to minimize the possibility of vapors accumulating at sources of ignition.

(iv) Whenever equipment such as a cargo heater or cooler on commercial vehicles is a type designed to be in operation while in transit, suitable means to stop the flow such as an excess flow valve or other device, shall be installed. This device will be actuated to stop the flow in the event of a break in the fuel supply line. All excess flow valves shall comply with paragraph (b)(7)(iii) of this section.

(8) *System design and line pressure.* Systems may be of either vapor withdrawal or liquid withdrawal type and shall comply with the applicable requirements for the type of usage involved.

(9) *System enclosure and mounting.* (i) Housing or enclosures shall be designed to provide proper ventilation.

(ii) Hoods, domes, or removable portions of cabinets shall be provided with means to keep them firmly in place during transit.

(iii) Provision shall be incorporated in the assembly to hold the containers firmly in position and prevent their movement during transit in accordance with paragraph (e)(4)(iii) of this section.

(iv) Containers shall be mounted on a substantial support or base secured firmly to the vehicle chassis. Neither the container nor its support shall extend below the frame.

(10) *Piping—including pipe, tubing, and fittings.* (i) Regulators shall be connected directly to the container valve outlet or mounted securely by means of a support bracket and connected to the container valve or valves with a listed high pressure flexible connector.

(ii) Provision shall be made between the regulator outlet and the gas service lines by either a flexible connector or a tubing loop to provide for expansion, contraction, jarring, and vibration.

(iii) Pipe, tubing, and fittings shall conform to paragraph (b)(8) of this section except that the use of aluminum alloy piping is prohibited. Steel tubing shall have a minimum wall thickness of 0.049 inch. Steel piping or tubing shall be adequately protected against exterior corrosion.

(iv) Approved gas tubing fittings shall be employed for making tubing connections.

(v) The fuel line shall be firmly fastened in a protected location and where under the vehicle and outside and below any insulation or false bottom, fastenings shall be such as to prevent abrasion or damage to the gasline due to vibration. Where the fuel line passes through structural members or floors, a rubber grommet or equivalent shall be installed to prevent chafing.

(vi) The fuel line shall be installed to enter the vehicle through the floor directly beneath or adjacent to the appliance which it serves. When a branch line is required the tee connection shall be in the main fuel line and located under the floor and outside the vehicle.

(vii) All parts of the system assembly shall be so designed and secured as to preclude such parts working loose during transit.

(11) *Appliances.* (i) LP-Gas appliances shall be approved for use on commercial vehicles.

(ii) In the case of vehicles not intended for human occupancy and where the gas-fired heating appliance is used to protect the cargo, such heater may be of the unvented type but provision shall be made to dispose of the products of combustion to the outside.

(iii) In the case of vehicles intended for human occupancy, all gas-fired heating appliances, including water heaters, shall be designed or installed to provide for complete separation of the combustion system from the atmosphere of the living space. Such appliances shall be installed with the combustion air inlet assembly furnished as a component of the appliance and, also, with either—

(*a*) The flue gas outlet assembly furnished as a component of the appliance, or

(*b*) A listed roof jack if the appliance is listed for such use.

The combustion air inlet assembly, flue gas outlet assembly, and roof jack shall extend to the outside atmosphere.

(iv) Provision shall be made to insure an adequate supply of outside air for combustion.

(v) All gas-fired heating appliances and water heaters shall be equipped with an approved automatic device designed to shut off the flow of gas to the main burner and to the pilot in the event the pilot flame is extinguished.

(vi) Gas-fired appliances installed in the cargo space shall be located so they are readily accessible.

(vii) Appliances shall be constructed or protected to reduce to a minimum possible damage or impaired operation resulting from cargo shifting or handling.

(viii) Appliances inside the vehicle shall be located so that a fire at an appliance will not block egress of persons therefrom.

(12) *General precautions.* (i) DOT containers shall be marked, maintained, and requalified for use in accordance with the regulations of DOT.

(ii) Requalification of containers for continued service is the responsibility of the owner; containers shall be stamped with the date of requalification. When DOT cylinders are requalified by retesting, such retest shall be made in accordance with DOT regulations.

(iii) Containers shall not be charged with fuel unless they bear the proper markings of the code or specifications under which they were constructed, and in addition, with their water capacity. In the case of cylinders or portable containers filled by weight, the container shall be marked with its tareweight.

(iv) DOT containers which have been involved in a fire shall not be recharged until they have been requalified for service according to DOT regulations.

(v) American Petroleum Institute–American Society of Mechanical Engineers (API-ASME) containers or ASME containers which have been involved in a fire shall not be recharged until they have been retested in accordance with the requirements for their original hydrostatic test and found to be suitable for continued service.

(vi) Containers shall not be charged without the consent of the owner.

(vii) A permanent caution plate shall be provided on the appliance or adjacent to the container outside of any enclosure. It shall include the word "Caution" and following instructions, or instructions embodying substantially similar language.

(*a*) Be sure all appliance valves are closed before opening container valve.

(*b*) Connections at appliances, regulators, and containers must be checked periodically for leaks with soapy water or its equivalent.

(*c*) Never use a match or flame to check for leaks.

(*d*) Container valves must be closed when the equipment is not in use.

(13) *Charging of containers*. Containers shall be charged as provided in paragraph (b)(12) of this section.

(14) *Fire extinguisher*. Mobile cookunits shall be provided with at least one approved portable fire extinguisher having a minimum rating of 8–B,C.

(h) *Liquefied petroleum gas service stations*—(1) *Application*. This paragraph applies to storage containers, and dispensing devices, and pertinent equipment in service stations where LP-Gas is stored and is dispensed into fuel tanks of motor vehicles. See paragraph (e) of this section for requirements covering use of LP-Gas as a motor fuel. All requirements of paragraph (b) of this section apply to this paragraph unless otherwise noted.

(2) *Design pressure and classification of storage containers*. Storage containers shall be designed and classified in accordance with Table H–34.

TABLE H–34

Container type	For gases with vapor pressure not to exceed lb. per sq. in. gage of 100° F. (37.8 C.)	Minimum design pressure of container, lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U–68, U–69)	1949 edition of ASME Code (Par. U–200, U–201); 1950, 1952 1956, 1959, 1962, 1965 and 1968 (Division 1) editions of ASME Code, all editions of API–ASME Code [2]
[1] 200	215	200	250

[1] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100 percent of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U–68 and U–69). The minimum design pressure of containers shall be 125 percent of the container type designation when constructed under: (1) the 1949 ASME Code (Paragraphs U–200 and U–201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of the, ASME Code, and (3) all editions of the API–ASME Code.

[2] Construction of containers under the API–ASME Code is not authorized after July 1, 1961.

(3) *Container valves and accessories*. (i) A filling connection on the container shall be fitted with one of the following:

(*a*) A combination back-pressure check and excess flow valve.

(*b*) One double or two single back-pressure valves.

(*c*) A positive shutoff valve, in conjunction with either.

(*1*) An internal back-pressure valve, or

(*2*) An internal excess flow valve.

In lieu of an excess flow valve, filling connections may be fitted with a quick-closing internal valve, which shall remain closed except during operating periods. The mechanism for such valves may be provided with a secondary control which will cause it to close automatically in case of fire. When a fusible plug is used its melting point shall not exceed 220° F.

(ii) A filling pipe inlet terminal not on the container shall be fitted with a positive shutoff valve in conjunction with either;

(*a*) A back pressure check valve, or

(*b*) An excess flow check valve.

(iii) All openings in the container except those listed below shall be equipped with approved excess flow check valves:

(*a*) Filling connections as provided in subdivision (i) of this subparagraph.

(*b*) Safety relief connections as provided in paragraph (b)(7)(ii) of this section.

(*c*) Liquid-level gaging devices as provided in paragraphs (b)(7)(iv) and (19)(iv) of this section.

(*d*) Pressure gage connections as provided in paragraph (b)(7)(v) of this section.

(iv) All container inlets and outlets except those listed below shall be labeled to designate whether they connect with vapor or liquid (labels may be on valves):

(*a*) Safety relief valves.

(*b*) Liquid-level gaging devices.

(*c*) Pressure gages.

(v) Each storage container shall be provided with a suitable pressure gage.

(4) *Safety-relief valves*. (i) All safety-relief devices shall be installed as follows:

(*a*) On the container and directly connected with the vapor space.

(*b*) Safety-relief valves and discharge piping shall be protected against physical damage. The outlet shall be provided with loose-fitting rain caps. There shall be no return bends or restrictions in the discharge piping.

(*c*) The discharge from two or more safety relief valves having the same pressure settings may be run into a common discharge header. The cross-sectional area of such header shall be at least equal to the sum of the cross-sectional areas of the individual discharges.

(*d*) Discharge from any safety relief device shall not terminate in any building nor beneath any building.

(ii) Aboveground containers shall be provided with safety relief valves as follows:

(*a*) The rate of discharge, which may be provided by one or more valves, shall be not less than that specified in paragraph (b)(10)(ii) of this section.

(*b*) The discharge from safety relief valves shall be vented to the open air unobstructed and vertically upwards in such a manner as to prevent any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. On a container having a water capacity greater than 2,000 gallons, the discharge from the safety relief valves shall be vented away from the container vertically upwards to a point at least 7 feet above the container. Suitable provisions shall be made so that any liquid or condensate that may accumulate inside of the relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, a means shall be provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of the product escaping from the drain.

(iii) Underground containers shall be provided with safety relief valves as follows:

(*a*) The discharge from safety-relief valves shall be piped vertically upward to a point at least 10 feet above the ground. The discharge lines or pipes shall be adequately supported and protected against physical damage.

(*b*) Where there is a probability of the manhole or housing becoming flooded, the discharge from regulator vent lines should be above the highest probable water level.

(*c*) If no liquid is put into a container until after it is buried and covered, the rate of discharge of the relief valves may be reduced to not less than 30 percent of the rate shown in paragraph (b)(10)(ii) of this section. If liquid fuel is present during installation of containers, the rate of discharge shall be the same as for aboveground containers. Such containers shall not be uncovered until emptied of liquid fuel.

(5) *Capacity of liquid containers*. Individual liquid storage containers shall not exceed 30,000 gallons water capacity.

(6) *Installation of storage containers*. (i) (*a*) Each storage container used exclusively in service station operation shall comply with the following table which specifies minimum distances to a building, groups of buildings, and adjoining property lines which may be built upon.

Water capacity per container (gallons)	Minimum distances	
	Above ground and underground (feet)	Between aboveground containers (feet)
Up to 2,000	25	3
Over 2,000	50	5

NOTE: The above distances may be reduced to not less than 10 feet for service station buildings of other than wood frame construction.

(*b*) Readily ignitible material including weeds and long dry grass, shall be removed within 10 feet of containers.

(*c*) The minimum separation between LP-Gas containers and flammable liquid tanks shall be 20 feet and the minimum separation between a container and the centerline of the dike shall be 10 feet.

(*d*) LP-Gas containers located near flammable liquid containers shall be protected against the flow or accumulation of flammable liquids by diking, diversion curbs, or grading.

(*e*) LP-Gas containers shall not be located within diked areas for flammable liquid containers.

(*f*) Field welding is permitted only on saddle plates or brackets which were applied by the container manufacturer.

(*g*) When permanently installed containers are interconnected, provision shall be made to compensate for expansion, contraction, vibration, and settling of containers and interconnecting piping. Where flexible connections are used, they shall be of an approved type and shall be designed for a bursting pressure of not less than five times the vapor pressure of the product at 100° F. The use of nonmetallic hose is prohibited for interconnecting such containers.

(*h*) Where high water table or flood conditions may be encountered protection against container flotation shall be provided.

(ii) Aboveground containers shall be installed in accordance with this subdivision.

(*a*) Containers may be installed horizontally or vertically.

(*b*) Containers shall be protected by crash rails or guards to prevent physical damage unless they are so protected by virtue of their location. Vehicles shall not be serviced within 10 feet of containers.

(*c*) Container foundations shall be of substantial masonry or other noncombustible material. Containers shall be mounted on saddles which shall permit expansion and contraction, and shall provide against the excessive concentration of stresses. Corrosion protection shall be provided for tank-mounting areas. Structural metal container supports shall be protected against fire. This protection is not required on prefabricated storage and pump assemblies, mounted on a common base, with container bottom not more than 24 inches above ground and whose water capacity is 2,000 gallons or less if the piping connected to the storage and pump assembly is sufficiently flexible to minimize the possibility of breakage or leakage in the event of failure of the container supports.

(iii) Underground containers shall be installed in accordance with this subdivision.

(*a*) Containers shall be given a protective coating before being placed under ground. This coating shall be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. In lowering the container into place, care shall be exercised to minimize abrasion or other damage to the coating. Damage to the coating shall be repaired before backfilling.

(*b*) Containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.

(*c*) A minimum of 2 feet of earth cover shall be provided. Where ground conditions make compliance with this requirement impractical, equivalent protection against physical damage shall be provided. The portion of the container to which manhole and other connections are attached need not be covered. If the location is subjected to vehicular traffic, containers shall be protected by a concrete slab or other cover adequate to prevent the weight of a loaded vehicle imposing concentrated direct loads on the container shell.

(7) *Protection of container fittings.* Valves, regulators, gages, and other container fittings shall be protected against tampering and physical damage.

(8) *Transport truck unloading point.* (i) During unloading, the transport truck shall not be parked on public thoroughfares and shall be at least 5 feet from storage containers, and shall be positioned so that shutoff valves are readily accessible.

(ii) The filling pipe inlet terminal shall not be located within a building nor within 10 feet of any building or driveway. It shall be protected against physical damage.

(9) *Piping, valves, and fittings.* (i) Piping may be underground, above ground, or a combination of both. It shall be well supported and protected against physical damage and corrosion.

(ii) Piping laid beneath driveways shall be installed to prevent physical damage by vehicles.

(iii) Piping shall be wrought iron or steel (black or galvanized), brass or copper pipe; or seamless copper, brass, or steel tubing and shall be suitable for a minimum pressure of 250 p.s.i.g. Pipe joints may be screwed, flanged, brazed, or welded. The use of aluminum alloy piping or tubing is prohibited.

(iv) All shutoff valves (liquid or gas) shall be suitable for liquefied petroleum gas service and designed for not less than the maximum pressure to which they may be subjected. Valves which may be subjected to container pressure shall have a rated working pressure of at least 250 p.s.i.g.

(v) All materials used for valve seats, packing, gaskets, diaphragms, etc., shall be resistant to the action of LP-Gas.

(vi) Fittings shall be steel, malleable iron, or brass having a minimum working pressure of 250 p.s.i.g. Cast iron pipe fittings, such as ells, tees, and unions shall not be used.

(vii) All piping shall be tested after assembly and proved free from leaks at not less than normal operating pressures.

(viii) Provision shall be made for expansion, contraction, jarring, and vibration, and for settling. This may be accomplished by flexible connections.

(10) *Pumps and accessories.* All pumps and accessory equipment shall be suitable for LP-Gas service, and designed for not less than the maximum pressure to which they may be subjected. Accessories shall have a minimum rated working pressure of 250 p.s.i.g. Positive displacement pumps shall be equipped with suitable pressure actuated bypass valves permitting flow from pump discharge to storage container or pump suction.

(11) *Dispensing devices.* (i) Meters, vapor separators, valves, and fittings in the dispenser shall be suitable for LP-Gas service and shall be designed for a minimum working pressure of 250 p.s.i.g.

(ii) Provisions shall be made for venting LP-Gas contained in a dispensing device to a safe location.

(iii) Pumps used to transfer LP-Gas shall be equipped to allow control of the flow and to prevent leakage or accidental discharge. Means shall be provided outside the dispensing device to readily shut off the power in the event of fire or accident.

(iv) A manual shutoff valve and an excess flow check valve shall be installed downstream of the pump and ahead of the dispenser inlet.

(v) (*a*) Dispensing hose shall be resistant to the action of LP-Gas in the liquid phase and designed for a minimum bursting pressure of 1,250 p.s.i.g.

(*b*) An excess flow check valve or automatic shutoff valve shall be installed at the terminus of the liquid line at the point of attachment of the dispensing hose.

(vi) (*a*) LP-Gas dispensing devices shall be located not less than 10 feet from aboveground storage containers greater than 2,000 gallons water capacity. The dispensing devices shall not be less than 20 feet from any building (not including canopies), basement, cellar, pit, or line of adjoining property which may be built upon and not less than 10 feet from sidewalks, streets, or thoroughfares. No drains or blowoff lines shall be directed into or in proximity to the sewer systems used for other purposes.

(*b*) LP-Gas dispensing devices shall be installed on a concrete foundation or as part of a complete storage and dispensing assembly mounted on a common base, and shall be adequately protected from physical damage.

(*c*) LP-Gas dispensing devices shall not be installed within a building except that they may be located under a weather shelter or canopy provided this area is not enclosed on more than two sides. If the enclosing sides are adjacent to each other, the area shall be properly ventilated.

(vii) The dispensing of LP-Gas into the fuel container of a vehicle shall be performed by a competent attendant who shall remain at the LP-Gas dispenser during the entire transfer operation.

(12) *Additional rules.* There shall be no smoking on the driveway of service stations in the dispensing areas or transport truck unloading areas. Conspicuous signs prohibiting smoking shall be posted within sight of the customer being served. Letters on such signs shall be not less than 4 inches high. The motors of all vehicles being fueled shall be shut off during the fueling operations.

(13) *Electrical.* Electrical equipment and installations shall conform to paragraphs (b) (17) and (18) of this section.

(14) *Fire protection.* Each service station shall be provided with at least one

approved portable fire extinguisher having at least an 8-B, C, rating.

(i) *Scope*—(1) *Application.* (i) Paragraph (b) of this section applies to installations made in accordance with the requirements of paragraphs (c), (d), (e), (g), and (h) of this section, except as noted in each of those paragraphs.

(ii) Paragraphs (c) through (h) of this section apply as provided in each of those paragraphs.

(2) *Inapplicability.* This section does not apply to:

(i) Marine and pipeline terminals, natural gas processing plants, refineries, or tank farms other than those at industrial sites.

(ii) LP-Gas refrigerated storage systems;

(iii) LP-Gas when used with oxygen. The requirements of § 1910.252 shall apply to such use;

(iv) LP-Gas when used in utility gas plants. The National Fire Protection Association Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA No. 59-1968, shall apply to such use;

(v) Low-pressure (not in excess of one-half pound per square inch or 14 inches water column) LP-Gas piping systems, and the installation and operation of residential and commercial appliances including their inlet connections, supplied through such systems. For such systems, the National Fire Protection Association Standard for the Installation of Gas Appliances and Gas Piping, NFPA 54-1969 shall apply.

(3) *Retroactivity.* Unless otherwise stated, it is not intended that the provisions of this section be retroactive.

(i) Existing plants, appliances, equipment, buildings, structures, and installations for the storage, handling or use of LP-Gas, which were in compliance with the current provisions of the National Fire Protection Association Standard for the Storage and Handling of Liquefied Petroleum Gases NFPA No. 58, at the time of manufacture or installation may be continued in use, if such continued use does not constitute a recognized hazard that is causing or is likely to cause death or serious physical harm to employees.

(ii) Stocks of equipment and appliances on hand in such locations as manufacturers' storage, distribution warehouses, and dealers' storage and showrooms, which were in compliance with the current provisions of the National Fire Protection Association Standard for the Storage and Handling of Liquefied Petroleum Gases, NFPA No. 58, at the time of manufacture, may be placed in service, if such use does not constitute a recognized hazard that is causing or is likely to cause death or serious physical harm to employees.

§ 1910.111 Storage and handling of anhydrous ammonia.

(a) *General*—(1) *Scope.* (i) This standard is intended to apply to the design, construction, location, installation, and operation of anhydrous ammonia systems including refrigerated ammonia storage systems.

(ii) This standard does not apply to:

(*a*) Ammonia manufacturing plants.

(*b*) Refrigeration plants where ammonia is used solely as a refrigerant.

(2) *Definitions.* As used in this section.

(i) "Appurtenances"—All devices such as pumps, safety relief devices, liquid-level gaging devices, valves, and pressure gages.

(ii) "Cylinder"—A container of 1,000 pounds of water capacity or less constructed in accordance with Department of Transportation specifications.

(iii) "Code"—The Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels of the American Society of Mechanical Engineers (ASME)—1968.

(iv) "Container"—Includes all vessels, tanks, cylinders, or spheres used for transportation, storage, or application of anhydrous ammonia.

(v) "DOT"—U.S. Department of Transportation.

(vi) "Design pressure" is identical to the term "Maximum Allowable Working Pressure" used in the Code.

(vii) "Farm vehicle" (implement of husbandry)—A vehicle for use on a farm on which is mounted a container of not over 1,200 gallons water capacity.

(viii) "Filling density"—the percent ratio of the weight of the gas in a container to the weight of water at 60° F. that the container will hold.

(ix) "Gas"—Anhydrous ammonia in either the gaseous or liquefied state.

(x) "Gas mask"—Gas masks approved by the Bureau of Mines, U.S. Department of the Interior.

(xi) "Capacity"—Total volume of the container in standard U.S. gallons.

(xii) DOT specifications—Regulations of the Department of Transportation published in 49 CFR Chapter I.

(xiii) "DOT regulations"—See § 1910.111(a)(2)(xii).

(xiv) "DOT requirements"—See § 1910.111(a)(2)(xii).

(b) *Basic rules.* This paragraph applies to all paragraphs of this section unless otherwise noted.

(1) *Approval of equipment and systems.* The appurtenances of each system shall be listed by at least one of the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factory Mutual Engineering Corp.

(2) *Requirements for construction, original test and requalification of nonrefrigerated containers.* (i) Containers used with systems covered in paragraphs (c), (f), (g), and (h) of this section shall be constructed and tested in accordance with the Code except that construction under Table UW12 at a basic joint efficiency of under 80 percent is not authorized.

(ii) Containers built according to the Code do not have to comply with Paragraphs UG125 to UG128 inclusive, and Paragraphs UG132 and UG133 of the Code.

(iii) Containers exceeding 36 inches in diameter or 250 gallons water capacity shall be constructed to comply with one or more of the following:

(*a*) Containers shall be stress relieved after fabrication in accordance with the Code, or

(*b*) Cold-formed heads, when used, shall be stress relieved, or

(*c*) Hot-formed heads shall be used.

(iv) Welding to the shell, head, or any other part of the container subject to internal pressure shall be done in compliance with the Code. Other welding is permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer.

(v) Containers used with systems covered in paragraph (e) of this section shall be constructed and tested in accordance with the DOT specifications.

(vi) The provisions of subdivision (i) of this subparagraph shall not be construed as prohibiting the continued use or reinstallation of containers constructed and maintained in accordance with the 1949, 1950, 1952, 1956, 1959, and 1962 editions of the Code or any revisions thereof in effect at the time of fabrication.

(3) *Marking nonrefrigerated containers.* (i) System nameplates, when required, shall be permanently attached to the system so as to be readily accessible for inspection and shall include markings as prescribed in subdivision (ii) of this subparagraph.

(ii) Each container or system covered in paragraphs (c), (f), (g), and (h) of this section shall be marked as specified in the following:

(*a*) With a notation "Anhydrous Ammonia."

(*b*) With a marking identifying compliance with the rules of the Code under which the container is constructed.

Under ground: Container and system nameplate.
Above ground: Container.

(*c*) With a notation whether the system is designed for underground or aboveground installation or both.

(*d*) With the name and address of the supplier of the system or the trade name of the system and with the date of fabrication.

Under ground and above ground: System nameplate.

(*e*) With the water capacity of the container in pounds at 60° F. or gallons, U.S. Standard.

Under ground: Container and system nameplate.
Above ground: Container.

(*f*) With the design pressure in pounds per square inch.

Under ground: Container and system nameplate.
Above ground: Container.

(*g*) With the wall thickness of the shell and heads.

Under ground: Container and system nameplate.
Above ground: Container.

(*h*) With marking indicating the maximum level to which the container may be filled with liquid anhydrous ammonia at temperatures between 20° F. and 130° F. except on containers provided with fixed level indicators, such as fixed length dip tubes, or containers that are filled with weight. Markings shall be in increments of not more than 20° F.

Above ground and under ground: System nameplate or on liquid-level gaging device.

(*i*) With the total outside surface area of the container in square feet.

Under ground: System nameplate.
Above ground: No requirement.

(*j*) Marking specified on the container shall be on the container itself or on a nameplate permanently attached to it.

(4) *Marking refrigerated containers.* Each refrigerated container shall be marked with nameplate on the outer covering in an accessible place as specified in the following:

(i) With the notation, "Anhydrous Ammonia."

(ii) With the name and address of the builder and the date of fabrication.

(iii) With the water capacity of the container in gallons, U.S. Standard.

(iv) With the design pressure.

(v) With the minimum temperature in degrees Fahrenheit for which the container was designed.

(vi) The maximum allowable water level to which the container may be filled for test purposes.

(vii) With the density of the product in pounds per cubic foot for which the container was designed.

(viii) With the maximum level to which the container may be filled with liquid anhydrous ammonia.

(5) *Location of containers.* (i) Consideration shall be given to the physiological effects of ammonia as well as to adjacent fire hazards in selecting the location for a storage container. Containers shall be located outside of buildings or in buildings or sections thereof especially provided for this purpose.

(ii) Permanent storage containers shall be located at least 50 feet from a dug well or other sources of potable water supply, unless the container is a part of a water-treatment installation.

(iii) Permanent storage containers shall be located outside densely populated areas.

(iv) Container locations shall comply with table H-35:

TABLE H-35

Nominal capacity of container (gallons)	Minimum distances (feet) from container to:		
	Line of adjoining property which may be built upon highways and mainline of railroad	Place of public assembly	Institution occupancy
Over 500 to 2,000	25	150	250
Over 2,000 to 30,000	50	300	500
Over 30,000 to 100,000	50	450	750
Over 100,000	50	600	1,000

(v) Storage areas shall be kept free of readily ignitible materials such as waste, weeds, and long dry grass.

(6) *Container appurtenances.* (i) All appurtenances shall be designed for not less than the maximum working pressure of that portion of the system on which they are installed. All appurtenances shall be fabricated from materials proved suitable for anhydrous ammonia service.

(ii) All connections to containers except safety relief devices, gaging devices, or those fitted with No. 54 drill-size orifice shall have shutoff valves located as close to the container as practicable.

(iii) Excess flow valves where required by these standards shall close automatically at the rated flows of vapor or liquid as specified by the manufacturer. The connections and line including valves and fittings being protected by an excess flow valve shall have a greater capacity than the rated flow of the excess flow valve so that the valve will close in case of failure of the line or fittings.

(iv) Liquid-level gaging devices that require bleeding of the product to the atmosphere and which are so constructed that outward flow will not exceed that passed by a No. 54 drill-size opening need not be equipped with excess flow valves.

(v) Openings from the container or through fittings attached directly on the container to which pressure gage connections are made need not be equipped with excess flow valves if such openings are not larger than No. 54 drill size.

(vi) Excess flow and back pressure check valves where required by the standards in this section shall be located inside of the container or at a point outside as close as practicable to where the line enters the container. In the latter case installation shall be made in such manner that any undue strain beyond the excess flow or back pressure check valve will not cause breakage between the container and the valve.

(vii) Excess flow valves shall be designed with a bypass, not to exceed a No. 60 drill-size opening to allow equalization of pressures.

(viii) All excess flow valves shall be plainly and permanently marked with the name or trademark of the manufacturer, the catalog number, and the rated capacity.

(7) *Piping, tubing, and fittings.* (i) All piping, tubing, and fittings shall be made of material suitable for anhydrous ammonia service.

(ii) All piping, tubing, and fittings shall be designed for a pressure not less than the maximum pressure to which they may be subjected in service.

(iii) All refrigerated piping shall conform to the Refrigeration Piping Code, American National Standards Institute, B31.5–1966 with addenda B31.1a–1968 as it applies to ammonia.

(iv) Piping used on non-refrigerated systems shall be at least American Society for Testing and Materials (ASTM) A–53–69 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal. Such pipe shall be at least schedule 40 when joints are welded, or welded and flanged. Such pipe shall be at least schedule 80 when joints are threaded. Threaded connections shall not be back-welded. Brass, copper, or galvanized steel pipe shall not be used.

(v) Tubing made of brass, copper, or other material subject to attack by ammonia shall not be used.

(vi) Cast iron fittings shall not be used but this shall not prohibit the use of fittings made specifically for ammonia service of malleable, nodular, or high strength gray iron meeting American Society for Testing and Materials (ASTM) A47–68, ASTM 395–68, or ASTM A126–66 Class B or C.

(vii) Joint compounds shall be resistant to ammonia.

(8) *Hose specifications.* (i) Hose used in ammonia service shall conform to the joint Agricultural Ammonia Institute—Rubber Manufacturers Association Specifications for Anhydrous Ammonia Hose.

(ii) Hose subject to container pressure shall be designed for a minimum working pressure of 350 p.s.i.g. and a minimum burst pressure of 1,750 p.s.i.g. Hose assemblies, when made up, shall be capable of withstanding a test pressure of 500 p.s.i.g.

(iii) Hose and hose connections located on the low-pressure side of flow control or pressure-reducing valves shall be designed for a bursting pressure of not less than five times the pressure setting of the safety relief devices protecting that portion of the system but not less than 125 p.s.i.g. All connections shall be so designed and constructed that there will be no leakage when connected.

(iv) Where hose is to be used for transferring liquid from one container to another, "wet" hose is recommended. Such hose shall be equipped with approved shutoff valves at the discharge end. Provision shall be made to prevent excessive pressure in the hose.

(v) On all hose one-half inch outside diameter and larger, used for the transfer of anhydrous ammonia liquid or vapor, there shall be etched, cast, or impressed at 5-foot intervals the following information.

"Anhydrous Ammonia" xxx p.s.i.g. (maximum working pressure), manufacturer's name or trademark, year of manufacture.

In lieu of this requirement the same information may be contained on a nameplate permanently attached to the hose.

TABLE H-36

Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start to discharge pressure for safety relief valves.

Surface area (sq. ft.)	*Flow rate CFM air*
20	258
25	310
30	360
35	408
40	455
45	501
50	547
55	591
60	635
65	678
70	720
75	762
80	804
85	845
90	885
95	925
100	965
105	1,010
110	1,050
115	1,090
120	1,120
125	1,160
130	1,200
135	1,240
140	1,280

Surface area (sq. ft.)	*Flow rate CFM air*
145	1,310
150	1,350
155	1,390
160	1,420
165	1,460
170	1,500
175	1,530
180	1,570
185	1,600
190	1,640
195	1,670
200	1,710
210	1,780
220	1,850
230	1,920
240	1,980
250	2,050
260	2,120
270	2,180
280	2,250
290	2,320
300	2,380
310	2,450
320	2,510
330	2,570
340	2,640
350	2,700
360	2,760
370	2,830
380	2,890
390	2,950
400	3,010
450	3,320
500	3,620
550	3,910
600	4,200
650	4,480
700	4,760
750	5,040
800	5,300
850	5,590
900	5,850
950	6,120
1,000	6,380
1,050	6,640
1,100	6,900
1,150	7,160
1,200	7,410
1,250	7,660
1,300	7,910
1,350	8,160
1,400	8,410
1,450	8,650
1,500	8,900
1,550	9,140
1,600	9,380
1,650	9,620
1,700	9,860
1,750	10,090
1,800	10,330
1,850	10,560
1,900	10,800
1,950	11,030
2,000	11,260
2,050	11,490
2,100	11,720
2,150	11,950
2,200	12,180
2,250	12,400
2,300	12,630
2,350	12,850
2,400	13,080
2,450	13,300
2,500	13,520

"Surface Area=total outside surface area of container in square feet. When the surface area is not stamped on the nameplate or when the marking is not legible the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads:

Area=overall length in feet times outside diameter in feet times 3.1416.

(2) Cylindrical container with other than hemispherical heads:

Area=(overall length in feet plus 0.3 outside diameter in feet) times outside diameter in feet times 3.1416.

(3) Spherical container:

Area=outside diameter in feet squared times 3.1416."

"Flow Rate—CFM Air=cubic feet per minute of air required at standard conditions, 60° F. and atmospheric pressure (14.7 p.s.i.a.)."

"The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,500 square feet, the required flow rate can be calculated using the formula: Flow Rate CFM Air=22.11 $A^{0.82}$, where A= outside surface area of the container in square feet."

(9) *Safety relief devices.* (i) Every container used in systems covered by paragraphs (c), (f), (g), and (h) of this section shall be provided with one or more safety relief valves of the spring-loaded or equivalent type. The discharge from safety-relief valves shall be vented away from the container upward and unobstructed to the atmosphere. All relief-valve discharge openings shall have suitable rain caps that will allow free discharge of the vapor and prevent entrance of water. Provision shall be made for draining condensate which may accumulate. The rate of the discharge shall be in accordance with the provisions of Table H-36.

(ii) Container safety-relief valves shall be set to start-to-discharge as follows, with relation to the design pressure of the container:

Containers	Minimum (percent)	Maximum (percent)
ASME-U-68, U-69	110	125
ASME-U-200, U-201	95	100
ASME 1950, 1956, 1952, or 1962	95	100
API-ASME	95	100
U.S. Coast Guard	95	100

As required by DOT Regulations.

(iii) Safety relief devices used in systems covered by paragraphs (c), (f), (g), and (h) of this section shall be constructed to discharge at not less than the rates required in subdivision (i) of this subparagraph before the pressure is in excess of 120 percent (not including the 10 percent tolerance referred to in subdivision (ii) of this subparagraph) of the maximum permitted start-to-discharge pressure setting of the device.

(iv) Safety-relief valves shall be so arranged that the possibility of tampering will be minimized. If the pressure setting adjustment is external, the relief valves shall be provided with means for sealing the adjustment.

(v) Shutoff valves shall not be installed between the safety-relief valves and the container; except, that a shutoff valve may be used where the arrangement of this valve is such as always to afford full required capacity flow through the relief valves.

(vi) Safety-relief valves shall have direct communication with the vapor space of the container.

(vii) Each container safety-relief valve used with systems covered by paragraphs (c), (f), (g), and (h) of this section shall be plainly and permanently marked with the symbol "NH_3" or "AA"; with the pressure in pounds-per-square-inch gage at which the valve is set to start-to-discharge; with the actual rate of discharge of the valve at its full open position in cubic feet per minute of air at 60° F. and atmospheric pressure; and with the manufacturer's name and catalog number. Example: "NH_3 250—4050 Air" indicates that the valve is suitable for use on an anhydrous ammonia container, is set to start-to-discharge at a pressure of 250 p.s.i.g., and that its rate of discharge at full open position (subdivisions (ii) and (iii) of this subparagraph) is 4,050 cubic feet per minute of air.

(viii) The flow capacity of the relief valve shall not be restricted by any connection to it on either the upstream or downstream side.

(ix) A hydrostatic relief valve shall be installed between each pair of valves in the liquid ammonia piping or hose where liquid may be trapped so as to relieve into the atmosphere at a safe location.

(10) *General.* (i) Personnel required to handle ammonia should be trained in safe operating practices and in the proper action to take in the event of emergencies.

(ii) All stationary storage installations shall have at least two suitable gas masks in readily accessible locations. Full face masks with ammonia canisters as approved by the Bureau of Mines, U.S. Department of the Interior, are suitable for emergency action for most leaks, particularly those that occur outdoors. For protection in concentrated ammonia atmospheres self-contained breathing air apparatus is required.

(iii) Stationary storage installations shall have an easily accessible shower or a 50-gallon drum of water.

(iv) Each vehicle transporting ammonia in bulk except farm applicator vehicles shall carry a container of at least 5 gallons of water and shall be equipped with a full face mask.

(11) *Charging of containers.* (i) The filling densities for containers that are not refrigerated shall not exceed the following:

Type of container	Percent by weight	Percent by volume
Aboveground—Uninsulated	56	82
Aboveground—Uninsulated		87.5
Aboveground—Insulated	57	83.5
Underground—Uninsulated	58	85
DOT—In accord with DOT regulations.		

(ii) Aboveground uninsulated containers may be charged 87.5 percent by volume provided the temperature of the anhydrous ammonia being charged is determined to be not lower than 30° F. or provided the charging of the container is stopped at the first indication of frost or ice formation on its outside surface and is not resumed until such frost or ice has disappeared.

(iii) Any container, including DOT cargo and portable tanks, shipped under

DOT jurisdiction shall be filled according to DOT regulations.

(iv) Refer to paragraph (d) of this section for filling densities of refrigerated storage containers.

(12) *Transfer of liquids.* (i) Anhydrous ammonia shall always be at a temperature suitable for the material of construction and the design of the receiving container.

(ii) The employer shall require the continuous presence of an attendant in the vicinity of the operation during such time as ammonia is being transferred.

(iii) Containers shall be charged or used only upon authorization of the owner.

(iv) Containers shall be gaged and charged only in the open atmosphere or in buildings or areas thereof provided for that purpose.

(v) Pumps used for transferring ammonia shall be those manufactured for that purpose.

(*a*) Pumps shall be designed for at least 250 p.s.i.g. working pressure.

(*b*) Positive displacement pumps shall have, installed off the discharged port, a constant differential relief valve discharging into the suction port of the pump through a line of sufficient size to carry the full capacity of the pump at relief valve setting, which setting and installation shall be according to the pump manufacturer's recommendations.

(*c*) On the discharge side of the pump, before the relief valve line, there shall be installed a pressure gage graduated from 0 to 400 p.s.i.

(*d*) Plant piping shall contain shutoff valves located as close as practical to pump connections.

(vi) Compressors used for transferring or refrigerating ammonia shall be recommended for ammonia service by the manufacturer.

(*a*) Compressors shall be designed for at least 250 p.s.i.g. working pressure.

(*b*) Plant piping shall contain shutoff valves located as close as practical to compressor connections.

(*c*) A relief valve large enough to discharge the full capacity of the compressor shall be connected to the discharge before any shutoff valve.

(*d*) Compressors shall have pressure gages at suction and discharge graduated to at least one and one-half times the maximum pressure that can be developed.

(*e*) Adequate means, such as drainable liquid trap, shall be provided on the compressor suction to minimize the entry of liquid into the compressor.

(*f*) Where necessary to prevent contamination, an oil separator shall be provided on the discharge side of the compressor.

(vii) Loading and unloading systems shall be protected by suitable devices to prevent emptying of the storage container or the container being loaded or unloaded in the event of severance of the hose. Backflow check valves or properly sized excess flow valves shall be installed where necessary to provide such protection. In the event that such valves are not practical, remotely operated shutoff valves may be installed.

(13) *Tank car unloading points and operations.* (i) Provisions for unloading tank cars shall conform to the applicable recommendations contained in the DOT regulations.

(ii) The employer shall insure that unloading operations are performed by reliable persons properly instructed and given the authority to monitor careful compliance with all applicable procedures.

(iii) Caution signs shall be so placed on the track or car as to give necessary warning to persons approaching the car from open end or ends of siding and shall be left up until after the car is unloaded and disconnected from discharge connections. Signs shall be of metal or other suitable material, at least 12 by 15 inches in size and bear the words "STOP—Tank Car Connected" or "STOP—Men at Work" the word, "STOP," being in letters at least 4 inches high and the other words in letters at least 2 inches high. The letters shall be white on a blue background.

(iv) The track of a tank car siding shall be substantially level.

(v) Brakes shall be set and wheels blocked on all cars being unloaded.

(14) *Liquid-level gaging device.* (i) Each container except those filled by weight shall be equipped with an approved liquid-level gaging device. A thermometer well shall be provided in all containers not utilizing a fixed liquid-level gaging device.

(ii) All gaging devices shall be arranged so that the maximum liquid level to which the container is filled is readily determined.

(iii) Gaging devices that require bleeding of the product to the atmosphere such as the rotary tube, fixed tube, and slip tube devices shall be designed so that the maximum opening of the bleed valve is not larger than No. 54 drill size unless provided with an excess flow valve. (This requirement does not apply to farm vehicles used for the application of ammonia as covered in paragraph (h) of this section.)

(iv) Gaging devices shall have a design pressure equal to or greater than the design pressure of the container on which they are installed.

(v) Fixed tube liquid-level gages shall be designed and installed to indicate that level at which the container is filled to 85 percent of its water capacity in gallons.

(vi) Gage glasses of the columnar type shall be restricted to stationary storage installations. They shall be equipped with shutoff valves having metallic handwheels, with excess-flow valves, and with extra heavy glass adequately protected with a metal housing applied by the gage manufacturer. They shall be shielded against the direct rays of the sun.

(15) *Painting of containers.* Aboveground uninsulated containers should have a reflective surface maintained in good condition.

(16) *Electrical equipment and wiring.* (i) Electrical equipment and wiring for use in ammonia installations shall be general purpose or weather resistant as appropriate.

(ii) Electrical systems shall be installed and maintained in accordance with Subpart S of this part.

(c) *Systems utilizing stationary, nonrefrigerated storage containers.* This paragraph applies to stationary, nonrefrigerated storage installations utilizing containers other than those covered in paragraph (e) of this section. Paragraph (b) of this section applies to this paragraph unless otherwise noted.

(1) *Design pressure and construction of containers.* The minimum design pressure for nonrefrigerated containers shall be 250 p.s.i.g.

(2) *Container valves and accessories, filling and discharge connections.* (i) Each filling connection shall be provided with combination back-pressure check valve and excess-flow valve; one double or two single back-pressure check valves; or a positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.

(ii) All liquid and vapor connections to containers except filling pipes, safety relief connections, and liquid-level gaging and pressure gage connections provided with orifices not larger than No. 54 drill size as required in paragraphs (b)(6) (iv) and (v) of this section shall be equipped with excess-flow valves.

(iii) Each storage container shall be provided with a pressure gage graduated from 0 to 400 p.s.i. Gages shall be designated for use in ammonia service.

(iv) All containers shall be equipped with vapor return valves.

(3) *Safety-relief devices.* (i) Every container shall be provided with one or more safety-relief valves of the spring-loaded or equivalent type in accordance with paragraph (b)(9) of this section.

(ii) The rate of discharge of spring-loaded safety relief valves installed on underground containers may be reduced to a minimum of 30 percent of the rate of discharge specified in Table H-36. Containers so protected shall not be uncovered after installation until the liquid ammonia has been removed. Containers which may contain liquid ammonia before being installed underground and before being completely covered with earth are to be considered aboveground containers when determining the rate of discharge requirements of the safety-relief valves.

(iii) On underground installations where there is a probability of the manhole or housing becoming flooded, the discharge from vent lines shall be located above the high water level. All manholes or housings shall be provided with ventilated louvers or their equivalent, the area of such openings equalling or exceeding combined discharge areas of safety-relief valves and vent lines which discharge their content into the manhole housing.

(iv) Vent pipes, when used, shall not be restricted or of smaller diameter than the relief-valve outlet connection.

(v) If desired, vent pipes from two or more safety-relief devices located on the same unit, or similar lines from two or more different units may be run into a common discharge header, provided the capacity of such header is at least equal to the sum of the capacities of the individual discharge lines.

(4) *Reinstallation of containers.* (i) Containers once installed under ground shall not later be reinstalled above ground or under ground, unless they successfully withstand hydrostatic pressure retests at the pressure specified for the original hydrostatic test as required by the code under which constructed and show no evidence of serious corrosion.

(ii) Where containers are reinstalled under ground, the corrosion-resistant coating shall be put in good condition; see subpargraph (5)(iv) of this paragraph. Where containers are reinstalled above ground, safety devices or gaging devices shall comply with paragraph (b)(9) of this section and this subparagraph respectively for aboveground containers.

(5) *Installation of storage containers* (i) Containers installed above ground, except as provided in subdivision (v) of this subparagraph shall be provided with substantial concrete or masonry supports, or structural steel supports on firm concrete or masonry foundations. All foundations shall extend below the frost line.

(ii) Horizontal aboveground containers shall be so mounted on foundations as to permit expansion and contraction. Every container shall be supported to prevent the concentration of excessive loads on the supporting portion of the shell. That portion of the container in contact with foundations or saddles shall be protected against corrosion.

(iii) Containers installed under ground shall be so placed that the top of the container is below the frost line and in no case less than 2 feet below the surface of the ground. Should ground conditions make compliance with these requirements impracticable, installation shall be made otherwise to prevent physical damage. It will not be necessary to cover the portion of the container to which manhole and other connections are affixed. When necessary to prevent floating, containers shall be securely anchored or weighted.

(iv) Underground containers shall be set on a firm foundation (firm earth may be used) and surrounded with earth or sand well tamped in place. The container, prior to being placed under ground, shall be given a corrosion resisting protective coating. The container thus coated shall be so lowered into place as to prevent abrasion or other damage to the coating.

(v) Containers with foundations attached (portable or semiportable tank containers with suitable steel "runners" or "skids" and commonly known in the industry as "skid tanks") shall be designed and constructed in accordance with subparagraph (1) of this paragraph.

(vi) Secure anchorage or adequate pier height shall be provided against container flotation wherever sufficiently high flood water might occur.

(vii) The distance between underground containers of over 2,000 gallons capacity shall be at least 5 feet.

(6) *Protection of appurtenances.*

(i) Valves, regulating, gaging, and other appurtenances shall be protected against tampering and physical damage. Such appurtenances shall also be protected during transit of containers.

(ii) All connections to underground containers shall be located within a dome, housing, or manhole and with access thereto by means of a substantial cover.

(7) *Damage from vehicles.* Precaution shall be taken against damage to ammonia systems from vehicles.

(d) *Refrigerated storage systems.* This paragraph applies to systems utilizing containers with the storage of anhydrous ammonia under refrigerated conditions. All applicable rules of paragraph (b) of this section apply to this paragraph unless otherwise noted.

(1) *Design of containers.*

(i) The design temperature shall be the minimum temperature to which the container will be refrigerated.

(ii) Containers with a design pressure exceeding 15 p.s.i.g. shall be constructed in accordance with paragraph (b)(2) of this section, and the materials shall be selected from those listed in API Standard 620, Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Fourth Edition, 1970, Tables 2.02, R2.2, R2.2(A), R2.2.1, or R2.3.

(iii) Containers with a design pressure of 15 p.s.i.g. and less shall be constructed in accordance with the applicable requirements of API Standard 620 including its Appendix R.

(iv) When austenitic steels or nonferrous materials are used, the Code shall be used as a guide in the selection of materials for use at the design temperature.

(v) The filling density for refrigerated storage containers shall be such that the container will not be liquid full at a liquid temperature corresponding to the vapor pressure at the start-to-discharge pressure setting of the safety-relief valve.

(2) *Installation of refrigerated storage containers.* (i) Containers shall be supported on suitable noncombustible foundations designed to accommodate the type of container being used.

(ii) Adequate protection against flotation or other water damage shall be provided wherever high flood water might occur.

(iii) Containers for product storage at less than 32° F. shall be supported in such a way, or heat shall be supplied, to prevent the effects of freezing and consequent frost heaving.

(3) *Shutoff valves.* When operating conditions make it advisable, a check valve shall be installed on the fill connection and a remotely operated shutoff valve on other connections located below the maximum liquid level.

(4) *Safety relief devices.* (i) Safety relief valves shall be set to start-to-discharge at a pressure not in excess of the design pressure of the container and shall have a total relieving capacity sufficient to prevent a maximum pressure in the container of more than 120 percent of the design pressure. Relief valves for refrigerated storage containers shall be self-contained spring-loaded, weight-loaded, or self-contained pilot-operated type.

(ii) The total relieving capacity shall be the larger of:

(*a*) Possible refrigeration system upset such as (*1*) cooling water failure, (2) power failure, (*3*) instrument air or instrument failure, (*4*) mechanical failure of any equipment, (*5*) excessive pumping rates.

(*b*) Fire exposure determined in accordance with Compressed Gas Association (CGA) S-1, Part 3, Safety Relief Device Standards for Compressed Gas Storage Containers, 1959, except that "A" shall be the total exposed surface area in square feet up to 25 foot above grade or to the equator of the storage container if it is a sphere, whichever is greater. If the relieving capacity required for fire exposure is greater than that required by (*a*) of this subdivision, the additional capacity may be provided by weak roof to shell seams in containers operating at essentially atmospheric pressure and having an inherently weak roof-to-shell seam. The weak roof-to-shell seam is not to be considered as providing any of the capacity required in (*a*) of this subdivision.

(iii) If vent lines are installed to conduct the vapors from the relief valve, the back pressure under full relieving conditions shall not exceed 50 percent of the start-to-discharge pressure for pressure balanced valves or 10 percent of the start-to-discharge pressure for conventional valves. The vent lines shall be installed to prevent accumulation of liquid in the lines.

(iv) The valve or valve installation shall provide weather protection.

(v) Atmospheric storage shall be provided with vacuum breakers. Ammonia gas, nitrogen, methane, or other inert gases can be used to provide a pad.

(5) *Protection of container appurtenances.* Appurtenances shall be protected against tampering and physical damage.

(6) *Reinstallation of refrigerated storage containers.* Containers of such size as to require field fabrication shall, when moved and reinstalled, be reconstructed and reinspected in complete accordance with the requirements under which they were constructed. The containers shall be subjected to a pressure retest and if rerating is necessary, rerating shall be in accordance with applicable requirements.

(7) *Damage from vehicles.* Precaution shall be taken against damage from vehicles.

(8) *Refrigeration load and equipment.*

(i) The total refrigeration load shall be computed as the sum of the following:

(*a*) Load imposed by heat flow into the container caused by the temperature differential between design ambient temperature and storage temperature.

(*b*) Load imposed by heat flow into the container caused by maximum sun radiation.

(c) Maximum load imposed by filling the container with ammonia warmer than the design storage temperature.

(ii) More than one storage container may be handled by the same refrigeration system.

(9) *Compressors.*

(i) A minimum of two compressors shall be provided either of which shall be of sufficient size to handle the loads listed in subparagraphs (8)(i) (*a*) and (*b*) of this paragraph. Where more than two compressors are provided minimum standby equipment equal to the largest normally operating equipment shall be installed. Filling compressors may be used as standby equipment for holding compressors.

(ii) Compressors shall be sized to operate with a suction pressure at least 10 percent below the minimum setting of the safety valve(s) on the storage container and shall withstand a suction pressure at least equal to 120 percent of the design pressure of the container.

(10) *Compressor drives.*

(i) Each compressor shall have its individual driving unit.

(ii) An emergency source of power of sufficient capacity to handle the loads listed in subparagraphs (8)(i) (*a*) and (*b*) of this paragraph shall be provided unless facilities are available to safely dispose of vented vapors while the refrigeration system is not operating.

(11) *Automatic control equipment.*

(i) The refrigeration system shall be arranged with suitable controls to govern the compressor operation in accordance with the load as evidenced by the pressure in the container(s).

(ii) An emergency alarm system shall be installed to function in the event the pressure in the container(s) rises to the maximum allowable operating pressure.

(iii) An emergency alarm and shutoff shall be located in the condenser system to respond to excess discharge pressure caused by failure of the cooling medium.

(iv) All automatic controls shall be installed in a manner to preclude operation of alternate compressors unless the controls will function with the alternate compressors.

(12) *Separators for compressors.*

(i) An entrainment separator of suitable size and design pressure shall be installed in the compressor suction line of lubricated compression. The separator shall be equipped with a drain and gaging device.

(ii) An oil separator of suitable size shall be installed in the compressor discharge line. It shall be designed for at least 250 p.s.i.g. and shall be equipped with a gaging device and drain valve.

(13) *Condensers.* The condenser system may be cooled by air or water or both. The condenser shall be designed for at least 250 p.s.i.g. Provision shall be made for purging noncondensibles either manually or automatically.

(14) *Receiver and liquid drain.* A receiver shall be provided with a liquid-level control to discharge the liquid ammonia to storage. The receiver shall be designed for at least 250 p.s.i.g. and be equipped with the necessary connections, safety valves, and gaging device.

(15) *Insulation.* Refrigerated containers and pipelines which are insulated shall be covered with a material of suitable quality and thickness for the temperatures encountered. Insulation shall be suitably supported and protected against the weather. Weatherproofing shall be of a type which will not support flame propagation.

(e) *Systems utilizing portable DOT containers.* (1) *Conformance.* Cylinders shall comply with DOT specifications and shall be maintained, filled, packaged, marked, labeled, and shipped to comply with 49 CFR Chapter I and Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1–1954 (R1970).

(2) *Storage.* Cylinders shall be stored in an area free from ignitable debris and in such manner as to prevent external corrosion. Storage may be indoors or outdoors.

(3) *Heat protection.* Cylinders filled in accordance with DOT regulations will become liquid full at 145° F. Cylinders shall be protected from heat sources such as radiant flame and steampipes. Heat shall not be applied directly to cylinders to raise the pressure.

(4) *Protection.* Cylinders shall be stored in such manner as to protect them from moving vehicles or external damage.

(5) *Valve cap.* Any cylinder which is designed to have a valve protection cap shall have the cap securely in place when the cylinder is not in service.

(f) *Tank motor vehicles for the transportation of ammonia.* (1) This paragraph applies to containers and pertinent equipment mounted on tank motor vehicles including semitrailers and full trailers used for the transportation of ammonia. This paragraph does not apply to farm vehicles. For requirements covering farm vehicles, refer to paragraphs (g) and (h) of this section.

Paragraph (b) of this section applies to this paragraph unless otherwise noted. Containers and pertinent equipment for tank motor vehicles for the transportation of anhydrous ammonia, in addition to complying with the requirements of this section, shall also comply with the requirements of DOT.

(2) *Design pressure and construction of containers.* (i) The minimum design pressure for containers shall be that specified in the regulations of the DOT.

(ii) The shell or head thickness of any container shall not be less than three-sixteenth inch.

(iii) All container openings, except safety relief valves, liquid-level gaging devices, and pressure gages, shall be labeled to designate whether they communicate with liquid or vapor space.

(3) *Container appurtenances.* (i) All appurtenances shall be protected against physical damage.

(ii) All connections to containers, except filling connections, safety relief devices, and liquid-level and pressure gage connections, shall be provided with suitable automatic excess flow valves, or in lieu thereof, may be fitted with quick-closing internal valves, which shall remain closed except during delivery operations. The control mechanism for such valves may be provided with a secondary control remote from the delivery connections and such control mechanism shall be provided with a fusible section (melting point 208° F. to 220° F.) which will permit the internal valve to close automatically in case of fire.

(iii) Filling connections shall be provided with automatic back-pressure check valves, excess-flow valves, or quick-closing internal valves, to prevent back-flow in case the filling connection is broken. Where the filling and discharge connect to a common opening in the container shell and that opening is fitted with a quick-closing internal valve as specified in subdivision (ii) of this subparagraph, the automatic valve shall not be required.

(iv) All containers shall be equipped for spray loading (filling in the vapor space) or with an approved vapor return valve of adequate capacity.

(4) *Piping and fittings.* (i) All piping, tubing, and fittings shall be securely mounted and protected against damage. Means shall be provided to protect hoses while the vehicle is in motion.

(ii) Fittings shall comply with paragraph (b)(6) of this section. Pipe shall be Schedule 80.

(5) *Safety relief devices.* (i) The discharge from safety relief valves shall be vented away from the container upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. Size of discharge lines from safety valves shall not be smaller than the nominal size of the safety-relief valve outlet connection. Suitable provision shall be made for draining condensate which may accumulate in the discharge pipe.

(ii) Any portion of liquid ammonia piping which at any time may be closed at both ends shall be provided with a hydrostatic relief valve.

(6) *Transfer of liquids.* (i) The content of tank motor vehicle containers shall be determined by weight, by a suitable liquid-level gaging device, or other approved methods. If the content of a container is to be determined by liquid-level measurement, the container shall have a thermometer well so that the internal liquid temperature can be easily determined. This volume when converted to weight shall not exceed the filling density specified by the DOT.

(ii) Any pump, except a constant speed centrifugal pump, shall be equipped with a suitable pressure actuated bypass valve permitting flow from discharge to suction when the discharge pressure rises above a predetermined point. Pump discharge shall also be equipped with a spring-loaded safety relief valve set at a pressure not more than 135 percent of the setting of the bypass valve or more than 400 p.s.i.g., whichever is larger.

(iii) Compressors shall be equipped with manually operated shutoff valves on both suction and discharge connections. Pressure gages of bourdon-tube type shall be installed on the suction and discharge of the compressor before the shutoff valves. The compressor shall not be operated if either pressure gage is removed or is inoperative. A spring-loaded, safety-relief valve capable of discharging to atmosphere the full flow of gas from the compressor at a pressure not exceeding 300 p.s.i.g. shall be connected between the compressor discharge and the discharge shutoff valve.

(iv) Valve functions shall be clearly and legibly identified by metal tags or nameplates permanently affixed to each valve.

(7) *Full trailers and semitrailers.* (i) All full trailers shall be firmly and securely attached to the vehicle drawing them by means of suitable drawbars supplemented by a safety chain (or chains) or safety cables.

(ii) Every full trailer or semitrailer shall have a reliable system of brakes, and adequate provision shall be made to operate the brakes from the driver's seat.

(iii) Every full trailer shall be equipped with self-energizing brakes.

(iv) Full trailers shall be so designed that the towed vehicle will follow substantially in the path of the towing vehicle and will not whip or swerve dangerously from side to side.

(v) Where a fifth wheel is employed, it shall be ruggedly designed, securely fastened to both units, and equipped with a positive locking mechanism which will prevent separation of the two units except by manual release.

(8) *Protection against collision.* Each tank motor vehicle shall be provided with properly attached bumpers or chassis extension arranged to protect the tank, piping, valves, and fittings from physical damage in case of collision.

(9) *Chock blocks.* At least two chock blocks shall be provided. These blocks shall be placed to prevent rolling of the vehicle whenever it is parked during loading and unloading operations.

(10) *Portable tank containers (skid tanks).* Where portable tank containers are used for farm storage they shall comply with paragraph (c)(1) of this section. When portable tank containers are used in lieu of cargo tanks and are permanently mounted on tank motor vehicles for the transportation of ammonia, they shall comply with the requirements of this paragraph.

(g) *Systems mounted on farm vehicles other than for the application of ammonia*—(1) *Application.* This paragraph applies to containers of 1,200 gallons capacity or less and pertinent equipment mounted on farm vehicles (implements of husbandry) and used other than for the application of ammonia to the soil. Paragraph (b) of this section applies to this paragraph unless otherwise noted.

(2) *Design pressure and classification of containers.* (i) The minimum design pressure for containers shall be 250 p.s.i.g.

(ii) The shell or head thickness of any container shall be not less than three-sixteenths of an inch.

(3) *Mounting containers.* (i) A suitable "stop" or "stops" shall be mounted on the vehicle or on the container in such a way that the container shall not be dislodged from its mounting due to the vehicle coming to a sudden stop. Back slippage shall also be prevented by proper methods.

(ii) A suitable "hold down" device shall be provided which will anchor the container to the vehicle at one or more places on each side of the container.

(iii) When containers are mounted on four-wheel trailers, care shall be taken to insure that the weight is distributed evenly over both axles.

(iv) When the cradle and the tank are not welded together suitable material shall be used between them to eliminate metal-to-metal friction.

(4) *Container appurtenances.* (i) All containers shall be equipped with a fixed liquid-level gage.

(ii) All containers with a capacity exceeding 250 gallons shall be equipped with a pressure gage having a dial graduated from 0–400 p.s.i.

(iii) The filling connection shall be fitted with combination back-pressure check valve and excess-flow valve; one double or two single back-pressure check valves; or a positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve.

(iv) All containers with a capacity exceeding 250 gallons shall be equipped for spray loading or with an approved vapor return valve.

(v) All vapor and liquid connections except safety-relief valves and those specifically exempted by paragraph (b)(6)(v) of this section shall be equipped with approved excess-flow valves or may be fitted with quick-closing internal valves which, except during operating periods, shall remain closed.

(vi) Fittings shall be adequately protected from damage by a metal box or cylinder with open top securely fastened to the container or by rigid guards, well braced, welded to the container on both sides of the fittings or by a metal dome. If a metal dome is used, the relief valve shall be properly vented through the dome.

(vii) If a liquid withdrawal line is installed in the bottom of a container, the connections thereto, including hose, shall not be lower than the lowest horizontal edge of the vehicle axle.

(viii) Provision shall be made to secure both ends of the hose while in transit.

(5) *Marking the container.* There shall appear on each side and on the rear end of the container in letters at least 4 inches high, the words, "Caution—Ammonia" or the container shall be marked in accordance with DOT regulations.

(6) *Farm vehicles.*

(i) Farm vehicles shall conform with State regulations.

(ii) All trailers shall be securely attached to the vehicle drawing them by means of drawbars supplemented by suitable safety chains.

(iii) A trailer shall be constructed so that it will follow substantially in the path of the towing vehicle and will not whip or swerve dangerously from side to side.

(iv) All vehicles shall carry a can containing 5 gallons or more of water.

(h) *Systems mounted on farm vehicles for the application of ammonia.* (1) This paragraph applies to systems utilizing containers of 250 gallons capacity or less which are mounted on farm vehicles (implement of husbandry) and used for the application of ammonia to the soil. Paragraph (b) of this section applies to this paragraph unless otherwise noted. Where larger containers are used, they shall comply with paragraph (g) of this section.

(2) *Design pressure and classification of containers.* (i) The minimum design pressure for containers shall be 250 p.s.i.g.

(ii) The shell or head thickness of any container shall not be less than three-sixteenths inch.

(3) *Mounting of containers.* All containers and flow-control devices shall be securely mounted.

(4) *Container valves and accessories.* (i) Each container shall have a fixed liquid-level gage.

(ii) The filling connection shall be fitted with a combination back-pressure check valve and an excess-flow valve; one double or two single back-pressure check valves: or a positive shutoff valve in conjunction with an internal back-pressure check valve or an internal excess-flow valve.

(iii) The applicator tank may be filled by venting to open air provided the bleeder valve orifice does not exceed seven-sixteenths inch in diameter.

(iv) Regulation equipment may be connected directly to the tank coupling or flange, in which case a flexible connection shall be used between such regulating equipment and the remainder of the liquid withdrawal system. Regulating equipment not so installed shall be flexibly connected to the container shutoff valve.

(v) No excess flow valve is required in the liquid withdrawal line provided the controlling orifice between the contents of the container and the outlet of the shutoff valve does not exceed seven-sixteenths inch in diameter.

§ 1910.112 [Reserved]

§ 1910.113 [Reserved]

§ 1910.114 Effective dates.

(a) The provisions of this Subpart H shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.101(b).

§ 1910.102.

§ 1910.103 (a)(2), (b)(1)(i), (b)(1)(iii), (b)(2)(ii), and (b)(3).

§ 1910.105.

§ 1910.106 (b)(1), (b)(2), (b)(3), and (b)(4).

§ 1910.106 (b)(5), (c)(1), (c)(2), (c)(3), (c)(4), (c)(5), (c)(6), (d)(2), (d)(3)(ii), (d)(4)(i), (d)(4)(iii), (d)(4)(iv), (d)(5)(v), (d)(5)(vi)(*a*), (e)(3)(iii), (e)(3)(v), (e)(4), (e)(7), (f)(2)(iii), (f)(3)(i), (f)(4)(iii), (f)(4)(iv), (f)(4)(viii), (f)(5), (g), (h), and (i).

§ 1910.107 (b) (1), (b) (2), (b) (3), (b) (4), (b) (5) (i), (b) (5) (iii), (b) (5) (iv), (b) (6), (b) (7), (b) (8), (b) (10), (c) (1), (c) (4), (c) (5), (c) (6), (c) (7), (d), (e) (7), (e) (8), (f) (1), (f) (2), (h), (i), (j), (l) (2), (l) (3), (l) (5), (l) (6), (l) (7), and (m) (1).
§ 1910.108 (b), (c), (e) (1), (f) (2), (g) (3), (g) (4), and (g) (5).
§ 1910.108 (g) (6) and (h).
§ 1910.110.
§ 1910.111.

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a), or (b) of this section, if any standard in 41 CFR Part 50–204, other than a national consensus standard incorporated by reference in § 50–204.2(a) (1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart H which is derived from 41 CFR Part 50–204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.115 Sources of standards.

Sec.	*Source*
1910.101	41 CFR 50–204.67, 70, and 71.
1910.102	41 CFR 50–204.66.
1910.103	NFPA No. 50B–1968, Standard for Liquified Hydrogen Systems at Consumer Sites.
1910.104	NFPA No. 566–1965, Standard for the Installation of Bulk Oxygen Systems at Consumer Sites.
1910.105	NFPA No. 30–1969, Flammable and Combustible Liquids Code.
1910.107	NFPA No. 33–1969, Standard for Spray Finishing using Flammable and Combustible Materials.
1910.108	NFPA No. 34–1966, Standard for Dip Tanks Containing Flammable or Combustible Liquids.
1910.109	NFPA No. 492–1970, Code for Manufacture, Transportation, Storage and Use of Explosives and Blasting Agents.
1910.110	NFPA 58–69, Standard for the Handling of Liquified Petroleum Cases.
1910.111	ANSI K61.1–1966, Storage and Handling of Anhydrous Ammonia.

§ 1910.116 Standards organizations.

National Fire Protection Association (NFPA), 60 Batterymarch Street, Boston, MA 02110.
National Plant Food Institute, 1700 K Street NW., Washington, DC 20006.
Compressed Gas Association, Inc., 500 Fifth Avenue, New York, NY 10036.
American Society of Mechanical Engineers Inc., United Engineering Center, 345 East 47th Street, New York, NY 10017.
American Petroleum Institute, 1801 K Street NW., Washington, DC 20006.
National Board of Boiler and Pressure Vessel, Inspectors, 1155 North High Street, Columbus, OH 43201.
American National Standards Institute, 1430 Broadway, New York, NY 10018.
American Society for Testing and Materials (ASTM), 1916 Race Street Philadelphia, PA 19103.
Underwriters Laboratories, Inc. (UL), 207 East Ohio Street, Chicago, IL 60611.

Subpart I—Personal Protective Equipment

§ 1910.132 General requirements.

(a) *Application.* Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

(b) *Employee-owned equipment.* Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

(c) *Design.* All personal protective equipment shall be of safe design and construction for the work to be performed.

§ 1910.133 Eye and face protection.

(a) *General.* (1) Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors. No unprotected person shall knowingly be subjected to a hazardous environmental condition. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

(2) Protectors shall meet the following minimum requirements:

(i) They shall provide adequate protection against the particular hazards for which they are designed.

(ii) They shall be reasonably comfortable when worn under the designated conditions.

(iii) They shall fit snugly and shall not unduly interfere with the movements of the wearer.

(iv) They shall be durable.

(v) They shall be capable of being disinfected.

(vi) They shall be easily cleanable.

(vii) Protectors should be kept clean and in good repair.

(3) Persons whose vision requires the use of corrective lenses in spectacles, and who are required by this standard to wear eye protection, shall wear goggles or spectacles of one of the following types:

(i) Spectacles whose protective lenses provide optical correction.

(ii) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.

(iii) Goggles that incorporate corrective lenses mounted behind the protective lenses.

(4) Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

(5) When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.

(6) Design, construction, testing, and use of devices for eye and face protection shall be in accordance with American National Standard for Occupational and Educational Eye and Face Protection, Z87.1–1968.

§ 1910.134 Respiratory protection.

(a) *Permissible practice.* (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in paragraph (b) of this section.

(3) The employee shall use the provided respiratory protection in accordance with instructions and training received.

(b) *Requirements for a minimal acceptable program.* (1) Written standard operating procedures governing the selection and use of respirators shall be established.

(2) Respirators shall be selected on the basis of hazards to which the worker is exposed.

(3) The user shall be instructed and trained in the proper use of respirators and their limitations.

(4) Where practicable, the respirators should be assigned to individual workers for their exclusive use.

(5) Respirators shall be regularly cleaned and disinfected. Those issued for

the exclusive use of one worker should be cleaned after each day's use, or more often if necessary. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.

(6) Respirators shall be stored in a convenient, clean, and sanitary location.

(7) Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.

(8) Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.

(9) There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

(10) Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator user's medical status should be reviewed periodically (for instance, annually).

(11) Approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed in accordance with standards established by competent authorities. The U.S. Department of Interior, Bureau of Mines, and the U.S. Department of Agriculture are recognized as such authorities. Although respirators listed by the U.S. Department of Agriculture continue to be acceptable for protection against specified pesticides, the U.S. Department of the Interior, Bureau of Mines, is the agency now responsible for testing and approving pesticide respirators.

(c) *Selection of respirators.* Proper selection of respirators shall be made according to the guidance of American National Standard Practices for Respiratory Protection Z88.2-1969.

(d) *Air quality.* (1) Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators.

(2) Breathing air mav be supplied to respirators from cylinders or air compressors.

(i) Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178).

(ii) The compressor for supplying air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to insure that it meets the specifications in subparagraph (1) of this paragraph.

(3) Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

(4) Breathing gas containers shall be marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

(e) *Use of respirators.* (1) Standard procedures shall be developed for respirator use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

(2) The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issuance should be recorded.

(3) Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

(i) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

(ii) When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, standby men must be present with suitable rescue equipment.

(iii) Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby man or men with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.

(4) Respiratory protection is no better than the respirator in use, even though it is worn conscientiously. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.

(5) For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers shall be so instructed by competent persons. Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

(i) Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece. The worker's diligence in observing these factors shall be evaluated by periodic check. To assure proper protection, the facepiece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's facepiece fitting instructions.

(ii) Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed. Systems have been developed for mounting corrective lenses inside full facepieces. When a workman must wear corrective lenses as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal.

(iii) If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

(f) *Maintenance and care of respirators.* (1) A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

(i) Inspection for defects (including a leak check),

(ii) Cleaning and disinfecting,

(iii) Repair,

(iv) Storage

Equipment shall be properly maintained to retain its original effectiveness.

(2) (i) All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

(ii) Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

(iii) Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

(iv) A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

(3) Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

(4) Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

(5) (i) After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. The compartments should be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

(ii) Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

(iii) Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

(g) *Identification of gas mask canisters.* (1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(i)—

Canister for ------------------------------

(Name for atmospheric contaminant)

or

Type N Gas Mask Canister

(ii) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: "For respiratory protection in atmospheres containing not more than ------ percent by volume of------------

-----------------------------------."

(Name of atmospheric contaminant)

(iii) All of the markings specified above should be placed on the most conspicuous surface or surfaces of the canister.

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.

TABLE I-1

Atmospheric contaminants to be protected against	*Colors assigned**
Acid gases	White.
Hydrocyanic acid gas	White with ½-inch green stripe completely around the canister near the bottom.
Chlorine gas	White with ½-inch yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with ½-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with ½-inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

§ 1910.135 Occupational head protection.

Helmets for the protection of heads of occupational workers from impact and penetration from falling and flying objects and from limited electric shock and burn shall meet the requirements and specifications established in American National Standard Safety Requirements for Industrial Head Protection, Z89.1–1969.

§ 1910.136 Occupational foot protection.

Safety-toe footwear for employees shall meet the requirements and specifications in American National Standard for Men's Safety-Toe Footwear, Z41.1–1967.

§ 1910.137 Electrical protective devices.

Rubber protective equipment for electrical workers shall conform to the requirements established in the American National Standards Institute Standards as specified in the following list:

Item	*Standard*
Rubber insulating gloves	J6.6–1967.
Rubber matting for use around electric apparatus.	J6.7–1935 (R1962).
Rubber insulating blankets.	J6.4–1970.
Rubber insulating hoods	J6.2–1950 (R1962).
Rubber insulating line hose.	J6.1–1950 (R1962).
Rubber insulating sleeves.	J6.5–1962.

§ 1910.138 Effective dates.

(a) The provisions of this Subpart I shall become effective on August 27, 1971, except that:

(1) Any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation; and

(2) If any standard in 41 CFR Part 50–204, other than a national consensus standard incorporated by reference in § 50–204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart I which is derived from 41 CFR Part 50–204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.139 Sources of standards.

Sec.	*Source*
1910.132	41 CFR 50–204.7.
1910.133(a)	ANSI Z87.1–1968, Eye and Face Protection.
1910.134	ANSI Z88.2–1969, Standard Practice for Respiratory Protection.
1910.134 Table I–I.	ANSI K13.1–1967, Indentification of Gas Mask Canister.
1910.135	ASNI Z89.1–1969, Safety Requirements for Industrial Head Protection.
1910.136	ANSI Z41.1–1967, Men's Safety-Toe Footwear.
1910.137	ANSI Z9.4–1968, Ventilation and Safe Practices of Abrasive Blasting Operations.

§ 1910.140 Standards organizations.

Specific standards of the following organization have been referenced in this part. Copies of the referenced materials may be obtained from the issuing organization.

American National Standards Institute, 1430 Broadway, New York, NY 10018.

Subpart J—General Environmental Controls

§ 1910.141 Sanitation.

(a) *General requirements*—(1) *Housekeeping.* (i) All places of employment, passageways, storerooms, and servicerooms shall be kept clean and orderly and in a sanitary condition.

(ii) The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable.

(iii) Cleaning and sweeping shall be done in such a manner as to minimize the contamination of the air with dust and, so far as is practicable, shall be done outside of working hours.

(iv) To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.

(2) *Expectorating.* (i) Expectorating upon the walls, floors, work places, or stairs of any establishment shall not be permitted.

(ii) Cuspidors are considered undesirable, but, if used, they shall be of such construction that they are cleanable. They shall be cleaned at least daily when in use.

(3) *Waste disposal.* (i) Any receptacle used for putrescible solid or liquid waste or refuse shall be so constructed that it does not leak and may be conveniently and thoroughly cleaned, and it shall be maintained in a sanitary condition. Such a receptacle shall be equipped with a tight-fitting cover.

(ii) All sweepings, solid or liquid wastes, refuse, and garbage shall be removed in such a manner as to avoid creating a nuisance or menace to health and as often as necessary to maintain the place of employment in a sanitary condition.

(4) *Rodent, insect, and vermin control.* Every enclosed work place and personal service room shall be constructed, equipped, and maintained, so far as reasonably practicable, in such a manner as to prevent the entrance or harborage of rodents, insects, and vermin of any kind.

(b) *Water supply*—(1) *Potable water.* (i) An adequate supply of potable water shall be provided for drinking, ablutionary, and culinary purposes in all places of employment. Drinking water should be made available within 200 feet of any location at which employees are regularly engaged in work.

(ii) Sanitary drinking fountains shall be of a type and construction in accordance with the Standard Specification for Drinking Fountains, ANSI Z4.2–1942.

(iii) In all instances where water is cooled by ice, the construction of the container shall be such that the ice does not come in direct contact with the water.

(iv) Open containers such as barrels, pails, or tanks for drinking water from which the water must be dipped or poured, whether or not they are fitted with a cover, are prohibited.

(v) The common drinking cup is prohibited.

(vi) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(2) *Nonpotable water.* (i) Outlets for nonpotable water, such as water for industrial or firefighting purposes only, shall be posted to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(ii) There shall be no cross-connection, open or potential, between a system furnishing potable water and system furnishing nonpotable water.

(iii) Construction shall be such as to prevent backflow of contaminated water into a potable water system.

(iv) Nonpotable water shall not be used for bathing or for washing any portion of the person, clothing, dishes, or premises.

(c) *Toilet facilities*—(1) *General.* (i) Every place of employment shall be provided with adequate toilet facilities which are separate for each sex. The sewage disposal method shall comply with requirements of the health or other authorities having jurisdiction.

(ii) Toilet facilities shall be provided so as to be readily accessible to all employees. Toilet facilities so located that employees must use more than one floor-to-floor flight of stairs to or from them are not considered as readily accessible. As far as is practicable, toilet facilities should be located within 200 feet of all locations at which workers are regularly employed.

(iii) Water closets shall be provided for each sex according to the following table. The number to be provided for each sex shall in every case be based on the maximum number of persons of that sex employed at any one time at work on the premises for which the facilities are furnished. When persons other than employees are permitted the use of toilet facilities on the premises, a reasonable allowance shall be made for such other persons in estimating the minimum number of toilet facilities required.

Number of persons	*Minimum number of facilities*
1 to 9	1
10 to 24	2
25 to 49	3
50 to 74	4
75 to 100	5
over 100	1 for each additional 30 persons.

Where 10 or more are employed, urinals may be provided. One water closet less than the number specified in the foregoing may be provided for each urinal, except that the number of water closets in such cases may not be reduced to less than two-thirds of the number specified in the foregoing. Two feet of trough urinal shall be considered as equivalent to one individual urinal.

(iv) An adequate supply of toilet paper with holder shall be provided for every water closet.

(v) Covered receptacles shall be kept in all toilet rooms used by women.

(vi) Adequate washing facilities shall be provided in every toilet room or be adjacent thereto.

(2) *Construction of toilet rooms.* (i) Each toilet facility (closet) shall occupy a separate compartment, which should be equipped with a door, latch, and clothes hanger.

(ii) The walls of compartments or partitions between fixtures may be less than the height of room walls, but the top shall be sufficiently high to assure privacy.

(iii) The door to every toilet room shall be fitted with an effective self-closing device, and the entrance to the toilet room shall be so screened that the interior of the toilet room is not visible from the workroom.

(iv) In all toilet rooms installed on or after August 31, 1971, the floors and side walls, to a height of at least 6 inches, including the angle formed by the floor and side walls, shall be of watertight construction.

(v) The floors, walls, ceilings, partitions, and doors of all toilet rooms shall be of a finish that can be easily cleaned. In installations made on or after August 31, 1971, cove bases shall be provided to facilitate cleaning.

(vi) Toilet rooms, except those in work places accessible to men only, shall be completely enclosed with solid material that is nontransparent from the outside.

(3) *Construction and installation of toilet facilities.* (i) Every water closet bowl shall be set entirely free and open from all enclosing structures and shall be so installed that the space around the fixture can be easily cleaned. This provision does not prohibit the use of wall-hung type water closets.

(ii) Every water closet shall have a hinged openfront seat made of substantial material having a nonabsorbent finish.

(4) *Chemical closets and privies.* Chemical closets and privies shall be constructed and maintained in accordance with § 1910.143.

(d) *Washing facilities*—(1) *General.* Adequate facilities for maintaining personal cleanliness shall be provided in every place of employment. These shall be convenient for the employees for whom they are provided and shall be maintained in a sanitary condition.

(2) *Lavatories.* At least one lavatory with adequate hot and cold water, preferably from a combination supply fixture, shall be provided for every 10 employees (men or women) or portion thereof, up to 100 persons; and over 100 persons one lavatory for each additional 15 persons or portion thereof. Twenty-four inches of sink with individual faucet shall be considered as equal to one lavatory. In all instances, a suitable cleansing agent shall be provided at each wash place.

(3) *Towels.* Individual hand towels, or sections thereof, of cloth or paper, shall be provided and proper receptacles or other sanitary means maintained for the disposal of used towels. The provision of a towel for general or common use is prohibited.

(e) *Change rooms*—(1) *Separate facilities.* Separate change or dressing rooms equipped with individual clothes facilities shall be provided for each sex wherever it is the practice to change from street clothes or wherever it is necessary to change because the work performed involves exposure to excessive dirt, heat, fumes, vapor, or moisture. In the event that change rooms are not provided, facilities shall be furnished for hanging outer garments.

(2) *Drying facilities.* Where the process in which the worker is engaged is such that his working clothes become wet or have to be washed between shifts, provision shall be made to insure that such clothing is dry before reuse.

(f) *Retiring rooms for women.* Where 10 or more women are employed at any one time, at least one retiring room shall be provided for rest and emergencies. Where fewer than 10 women are employed and a restroom is not furnished, some equivalent space shall be provided which can be properly screened for privacy and made suitable for the use of women employees. At least one couch or bed shall be provided in every place where more than 10 women are employed. The required number of such beds or couches follows:

10 to 100	1 bed
100 to 250	2 beds

1 additional bed for each additional 250 women employees. A minimum of 60 square feet of floor space per bed or couch shall be provided.

(g) *Lunchrooms*—(1) *General.* In all places of employment where employees are permitted to lunch on the premises, an adequate space suitable for that purpose shall be provided for the maximum number of employees who may use such space at one time. Such space shall be physically separate from any location where there is exposure to toxic materials.

(2) *Waste disposal containers.* An adequate number of covered receptacles constructed of a smooth, corrosion-resistant, easily cleanable, or disposable material, shall be provided by the employer and used by the employees for the disposal of all waste food. Such receptacles shall be emptied not less than once daily and shall be maintained in a clean and sanitary manner.

(3) *Location.* (i) No food shall be stored or eaten where there are present any toxic materials or substances that may be injurious to health.

(ii) No food shall be stored or eaten in any toilet room.

(iii) In every establishment where there is exposure to injurious dusts or other toxic materials, a separate lunchroom shall be maintained unless it is convenient for the employees to lunch away from the premises. The following number of square feet per person, based on the maximum number of persons using the room at one time, shall be required:

Number of persons	*Square feet per person*
25 and less	13
26–74	12
75–149	11
150 and over	10

(h) *Food handling.* All employee food service facilities and operations shall meet the requirements of "Food Service Sanitation Ordinance and Code," Part V, "Food Service Sanitation Manual," U.S. Public Health Service Publication No. 934 (1965). In all places of employment where all or part of the food service is provided by vending machines, the food dispensed shall be prepared, and the machine operated in accordance with the requirements of "Vending of Foods and Beverages, A Sanitation Ordinance and Code," U.S. Public Health Service Publication No. 546 (1965).

(i) *Scope.* This section applies to all permanent places of employment except where domestic, mining, or agricultural work only is performed. Measures for the control of toxic materials are considered to be outside the scope of this section.

§ 1910.142 Temporary labor camps.

(a) *Site.* (1) All sites used for camps shall be adequately drained. They shall not be subject to periodic flooding, nor located within 200 feet of swamps, pools, sink holes, or other surface collections of water unless such quiescent water surfaces can be subjected to mosquito control measures. The camp shall be located so the drainage from and through the camp will not endanger any domestic or public water supply. All sites shall be graded, ditched, and rendered free from depressions in which water may become a nuisance.

(2) All sites shall be adequate in size to prevent overcrowding of necessary structures. The principal camp area in which food is prepared and served and where sleeping quarters are located shall be at least 500 feet from any area in which livestock is kept.

(3) The grounds and open areas surrounding the shelters shall be maintained in a clean and sanitary condition free from rubbish, debris, waste paper, garbage, or other refuse.

(4) Whenever the camp is closed for the season or permanently, all garbage, manure, and other refuse shall be collected and so disposed of as to prevent nuisance. All abandoned privy pits shall be filled with earth and the grounds and buildings left in a clean and sanitary condition. If privy buildings remain, they shall be locked or otherwise secured to prevent entrance.

(b) *Shelter.* (1) Every shelter in the camp shall be constructed in a manner which will provide protection against the elements.

(2) Each room used for sleeping purposes shall contain at east 50 square feet

of floor space for each occupant. At least a 7-foot ceiling shall be provided.

(3) Beds, cots, or bunks, and suitable storage facilities such as wall lockers for clothing and personal articles shall be provided in every room used for sleeping purposes. Such beds or similar facilities shall be spaced not closer than 36 inches both laterally and end to end, and shall be elevated at least 12 inches from the floor. If double-deck bunks are used, they shall be spaced not less than 48 inches both laterally and end to end. The minimum clear space between the lower and upper bunk shall be not less than 27 inches. Triple-deck bunks are prohibited.

(4) The floors of each shelter shall be constructed of wood, asphalt, or concrete. Wooden floors shall be of smooth and tight construction. The floors shall be kept in good repair.

(5) All wooden floors shall be elevated not less than 1 foot above the ground level at all points to prevent dampness and to permit free circulation of air beneath.

(6) Nothing in this section shall be construed to prohibit "banking" with earth or other suitable material around the outside walls in areas subject to extreme low temperatures.

(7) All living quarters shall be provided with windows the total of which shall be not less than one-tenth of the floor area. At least one-half of each window shall be so constructed that it can be opened for purposes of ventilation.

(8) All exterior openings shall be effectively screened with 16-mesh material. All screen doors shall be equipped with self-closing devices.

(9) In a room where workers cook, live, and sleep a minimum of 100 square feet per person shall be provided. Sanitary facilities shall be provided for storing and preparing food.

(10) In camps where cooking facilities are used in common, stoves (in ratio of one stove to 10 persons or one stove to two families) shall be provided in an enclosed and screened shelter. Sanitary facilities shall be provided for storing and preparing food.

(11) All heating, cooking, and water heating equipment shall be installed in accordance with State and local ordinances, codes, and regulations governing such installations. If a camp is used during cold weather, adequate heating equipment shall be provided.

(c) *Water supply*. (1) An adequate and convenient water supply, approved by the appropriate health authority, shall be provided in each camp for drinking, cooking, bathing, and laundry purposes.

(2) A water supply shall be deemed adequate if it is capable of delivering 35 gallons per person per day to the campsite at a peak rate of 2½ times the average hourly demand.

(3) The distribution lines shall be capable of supplying water at normal operating pressures to all fixtures for simultaneous operation. Water outlets shall be distributed throughout the camp in such a manner that no shelter is more than 100 feet from a yard hydrant if water is not piped to the shelters.

(4) Where water under pressure is available, one or more drinking fountains shall be provided for each 100 occupants or fraction thereof. The construction of drinking fountains shall comply with ANSI Standard Specifications for Drinking Fountains, Z4.2–1942. Common drinking cups are prohibited.

(d) *Toilet facilities*. (1) Toilet facilities adequate for the capacity of the camp shall be provided.

(2) Each toilet room shall be located so as to be accessible without any individual passing through any sleeping room. Toilet rooms shall have a window not less than 6 square feet in area opening directly to the outside area or otherwise be satisfactorily ventilated. All outside openings shall be screened with 16-mesh material. No fixture, water closet, chemical toilet, or urinal shall be located in a room used for other than toilet purposes.

(3) A toilet room shall be located within 200 feet of the door of each sleeping room. No privy shall be closer than 100 feet to any sleeping room, dining room, lunch area, or kitchen.

(4) Where the toilet rooms are shared, such as in multifamily shelters and in barracks type facilities, separate toilet rooms shall be provided for each sex. These rooms shall be distinctly marked "for men" and "for women" by signs printed in English and in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. If the facilities for each sex are in the same building, they shall be separated by solid walls or partitions extending from the floor to the roof or ceiling.

(5) Where toilet facilities are shared, the number of water closets or privy seats provided for each sex shall be based on the maximum number of persons of that sex which the camp is designed to house at any one time, in the ratio of one such unit to each 15 persons, with a minimum of two units for any shared facility.

(6) Urinals shall be provided on the basis of one unit or 2 linear feet of urinal trough for each 25 men. The floor from the wall and for a distance not less than 15 inches measured from the outward edge of the urinals shall be constructed of materials impervious to moisture. Where water under pressure is available, urinals shall be provided with an adequate water flush. Urinal troughs in privies shall drain freely into the pit or vault and the construction of this drain shall be such as to exclude flies and rodents from the pit.

(7) Every water closet installed on or after August 31, 1971, shall be located in a toilet room.

(8) Each toilet room shall be lighted naturally, or artificially by a safe type of lighting at all hours of the day and night.

(9) An adequate supply of toilet paper shall be provided in each privy, water closet, or chemical toilet compartment.

(10) Privies and toilet rooms shall be kept in a sanitary condition. They shall be cleaned at least daily.

(e) *Sewage disposal facilities*. In camps where public sewers are available, all sewer lines and floor drains from buildings shall be connected thereto.

(f) *Laundry, handwashing, and bathing facilities*. (1) Laundry, handwashing, and bathing facilities shall be provided in the following ratio:

(i) Handwash basin per family shelter or per six persons in shared facilities.

(ii) Shower head for every 10 persons.

(iii) Laundry tray or tub for every 30 persons.

(iv) Slop sink in each building used for laundry, hand washing, and bathing.

(2) Floors shall be of smooth finish but not slippery materials; they shall be impervious to moisture. Floor drains shall be provided in all shower baths, shower rooms, or laundry rooms to remove waste water and facilitate cleaning. All junctions of the curbing and the floor shall be coved. The walls and partitions of shower rooms shall be smooth and impervious to the height of splash.

(3) An adequate supply of hot and cold running water shall be provided for bathing and laundry purposes. Facilities for heating water shall be provided.

(4) Every service building shall be provided with equipment capable of maintaining a temperature of at least 70° F. during cold weather.

(5) Facilities for drying clothes shall be provided.

(6) All service buildings shall be kept clean.

(g) *Lighting*. Where electric service is available, each habitable room in a camp shall be provided with at least one ceiling-type light fixture and at least one separate floor- or wall-type convenience outlet. Laundry and toilet rooms and rooms where people congregate shall contain at least one ceiling- or wall-type fixture. Light levels in toilet and storage rooms shall be at least 20 foot-candles 30 inches from the floor. Other rooms, including kitchens and living quarters, shall be at least 30 foot-candles 30 inches from the floor.

(h) *Refuse disposal*. (1) Fly-tight, rodent-tight, impervious, cleanable or single service containers, approved by the appropriate health authority shall be provided for the storage of garbage. At least one such container shall be provided for each family shelter and shall be located within 100 feet of each shelter on a wooden, metal, or concrete stand.

(2) Garbage containers shall be kept clean.

(3) Garbage containers shall be emptied when full, but not less than twice a week.

(i) *Construction and operation of kitchens, dining hall, and feeding facilities*. (1) In all camps where central dining or multiple family feeding operations are permitted or provided, the food handling facilities shall comply with the requirements of the "Food Service Sanitation Ordinance and Code," Part V of the "Food Service Sanitation Manual," U.S. Public Health Service Publication 934 (1965).

(2) A properly constructed kitchen and dining hall adequate in size, separate from the sleeping quarters of any of the workers or their families, shall be provided in connection with all food handling facilities. There shall be no direct opening from living or sleeping quarters into a kitchen or dining hall.

(3) No person with any communicable disease shall be employed or permitted to work in the preparation, cooking, serving, or other handling of food, foodstuffs, or materials used therein, in any kitchen or dining room operated in connection with a camp or regularly used by persons living in a camp.

(j) *Insect and rodent control.* Effective measures shall be taken to prevent infestation by and harborage of animal or insect vectors or pests.

(k) *First aid.* (1) Adequate first aid facilities approved by a health authority shall be maintained and made available in every labor camp for the emergency treatment of injured persons.

(2) Such facilities shall be in charge of a person trained to administer first aid and shall be readily accessible for use at all times.

(l) *Reporting communicable disease.* (1) It shall be the duty of the camp superintendent to report immediately to the local health officer the name and address of any individual in the camp known to have or suspected of having a communicable disease.

(2) Whenever there shall occur in any camp a case of suspected food poisoning or an unusual prevalence of any illness in which fever, diarrhea, sore throat, vomiting, or jaundice is a prominent symptom, it shall be the duty of the camp superintendent to report immediately the existence of the outbreak to the health authority by telegram or telephone.

§ 1910.143 Nonwater carriage disposal systems.

(a) *Acceptable industrial disposal systems.* (1) The waste disposal systems described in subparagraphs (2), (3), (4), (5), (6), or (7) of this paragraph, may be used only where not prohibited by codes and regulations of local authorities, and where water closets are not feasible due either to the lack of an adequate water supply or to the location or temporary nature of the operation requiring the facility. The number of units required for a place of employment shall be as specified in §§ 1910.141 and 1910.142.

(2) Privies constructed in conformity with paragraph (b) of this section may be used for the disposal of human excreta where their use will not contaminate ground or surface water because of privy location, type of soil, or ground-water table.

(3) Chemical toilets constructed in conformity with paragraph (c) of this section may be used in place of privies or where a privy is not permitted due to possible contamination of ground and surface water.

(4) Recirculating toilets constructed in conformity with paragraph (f) of this section may be used in place of privies or chemical toilets.

(5) Combustion toilets constructed in conformity with paragraph (e) of this section may be used in place of privies, chemical toilets, or recirculating toilets.

(6) Portable toilets constructed in conformity with paragraph (g) of this section may be used for temporary or mobile installations. Such temporary units may be:

(i) Chemical, recirculating, or combustion toilets designed for installation in or as an integral part of a skid mounted portable privy building, or in a separate toilet room, or

(ii) Portable privies designed for installation over a manhole of a sanitary or a combined waste water sewer system.

(7) A seepage pit constructed in conformity with paragraph (d) of this section may be used for the disposal of waste water from culinary activity, temporary bathing facilities, and clothes washing facilities where there is no available piped water supply. Human excreta shall not be discharged into a seepage pit. All units described in this paragraph shall comply with applicable codes and regulations of local authorities.

(b) *Privy specifications.* (1) A privy pit shall be separated by a minimum distance of 100 feet between the privy and a well, spring, or other source of water supply for drinking, bathing, or culinary purposes.

(i) At no time shall the pit bottom of a privy extend into ground water, nor shall it be constructed within 100 feet of the shoreline of any open body of water. Phreatic water, such as may be found in surface soil at depths of 10 feet or less, shall not be interpreted as ground water unless there is evidence of positive directional flow through the pit.

(ii) The privy shall be so located and so constructed that no surface water may enter into the pit either as runoff or as flood water.

(iii) The pit shall be constructed of such material and in such a manner as to prevent rapid deterioration, provide adequate capacity, and facilitate maintenance in a satisfactory manner under ordinary conditions of usage.

(iv) The pit and seat area shall be vented by a flue or vent pipe having not less than 7 square inches cross-sectional area, so as to provide a continuous escape of odors.

(v) The pit shall provide a capacity of 50 cubic feet for each seat installed in the privy building. The vault within 16 inches of the surface grade shall not be counted as part of the 50-cubic-foot capacity.

(vi) Pit cribbing shall fit firmly and be in uniform contact with the earth walls on all sides, and shall rise at least 6 inches above the original ground line and descend to the full depth of the pit. However, pit cribbing below the soil line may be omitted in rock formations.

(vii) An earth plateau shall be constructed level with the top of the pit cribbing, and extend horizontally for a distance of at least 18 inches before sloping to the original ground level.

(2) Privy building shall be firmly anchored, rigidly constructed, and free from hostile surface features, such as exposed nail points, sharp edges, rough or broken boards, etc., and shall provide privacy and protection from the elements. It shall be ventilated by leaving a 4-inch opening at the top of all the walls just beneath the roof.

(i) The building shall be of fly-tight construction, doors shall be self-closing, and vent and building openings shall be screened with 16-mesh screen of durable material. The vent shall extend 12 inches above the roof.

(ii) The seat shall be so spaced as to provide a minimum clear space of 24 inches between each seat in multiple unit installations, and shall provide 12 inches clear space from the seat opening to the side wall in single and multiple units.

(iii) The seat riser shall have an inside clearance of not less than 21 inches from the front wall and not less than 24 inches from the rear wall of the privy building.

(iv) The seat top shall be not less than 12 inches nor more than 16 inches above the floor.

(v) The seat opening shall be covered with an attached, movable toilet seat and lid, so constructed and installed that when closed it will limit access of insects, and which can be raised to allow sanitary use as a urinal.

(vi) The floor and riser shall be built of impervious material or tongue and groove lumber, and in a manner to deny access of insects.

(vii) Where electricity is available, lighting shall be provided with an intensity of not less than 10 foot-candles 30 inches above the floor.

(viii) A conveniently located receptacle or dispenser containing an adequate supply of toilet paper shall be provided for each seat in each privy building.

(c) *Chemical toilet specifications.* (1) Rooms, buildings, or shelters housing chemical toilets shall be of sound construction and easy to clean, and shall provide shelter and privacy. The toilet rooms shall be ventilated to the outside and adequately lighted, and all openings into the toilet room shall be covered with 16-mesh screen. The minimum requirements given in subparagraphs (2) through (7) of this paragraph shall apply.

(2) Caustic receptacles shall be durable and corrosion proof, and provide a minimum capacity of 100 gallons per seat.

(3) The caustic receptacle charge per seat shall be a minimum of 25 pounds of caustic dissolved in 10 gallons of water.

(4) The chemical shall be drained and receptacle recharged every 6 months of continuous use, or at the beginning of each season of operation when in intermittent use, or when three-fourths full, whichever occurs first.

(5) Each seat in the building shall be provided with a conveniently located agitator.

(6) Receptacles shall be vented as prescribed in paragraph (b)(1)(iv) of this section.

(7) The receptacle shall be equipped with a manhole external to the privy building for cleaning and caustic removal purposes. The manhole shall be covered so as to prevent the escape of gases and odors.

(d) *Seepage pit construction.* (1) Seepage pit construction shall conform with requirements for privy pit construction in paragraph (b)(1) (i), (ii), (iii), (vi) and (vii) of this section. The seepage pit may be filled with stone or rubble of not less than nominal 1 inch diameter.

(2) Seepage pits shall be of such dimensions as to provide side wall area equal to at least 10 square feet per person served by the facility, or such greater area as may be required by the health agency having jurisdiction.

(3) Temporary piping connections from sinks or shower platforms may be discharged beneath the floor if they have traps in accordance with the provisions of American National Standard National Plumbing Code, A 40.8–1955.

(4) The platform covering the seepage pits shall be built of impervious material and in a manner to exclude insects.

(5) The platform shall be provided with an opening at least 1 foot in each dimension and have a rim at least 1 inch above the floor to prevent precipitation from accumulating on the platform floor.

(6) The platform opening shall be covered with a self-closing lid, so constructed that it can be easily opened by foot or hand, and so installed that when closed it will exclude insects and fit closely over the raised rim of the opening.

(e) *Combustion toilet.* (1) Combustion toilets and combustion toilet buildings, rooms, or shelters shall conform to the applicable specifications given for chemical toilets in paragraph (c) of this section.

(2) All external surfaces, including bowl and hopper, shall be easy to clean.

(3) The residue must be sterile and inert.

(4) The flue effluents must be free of bacteria.

(5) The combustion system and all fuel and electrical parts shall be safe and in compliance with applicable gas and electrical codes of local authorities. Where such codes do not exist, the installations shall comply with the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968).

(f) *Recirculating toilet specifications.* (1) Recirculating toilet buildings, rooms, or shelters shall conform to the applicable specifications given for chemical toilets in paragraph (c) of this section.

(2) All materials, bowl, piping, and fittings shall be corrosion resistant.

(3) Waste passages shall have smooth surfaces and be free of obstructions, recesses, or chambers that would permit fouling.

(4) Flushing shall be accomplished by a single control so arranged as to be operated without special knowledge or effort.

(5) Recirculating toilets shall conform to "Self-Contained, Electrically Operated Recirculating, Chemically Controlled Toilet." International Association of Plumbing and Mechanical Officials Trailer Standard TSC 12–65.

(6) The unit shall be maintained and cleaned; and water, filter, and odor-controlling chemical shall be replaced in accordance with the instructions of the manufacturer.

(g) *Portable toilet construction.* (1) A portable toilet may comprise the seat and its treatment unit to be installed in a structure, or it may comprise an entire prefabricated, skid mounted, or otherwise portable structure containing a seat or treatment units with seat.

(2) No pit, tank, or other subsurface structure shall be construed as part of a portable toilet.

(i) Portable privies must be installed over a pit conforming to paragraph (b)(1) of this section, or a manhole that is part of a sanitary or combined waste water disposal system.

(ii) No portable toilet shall discharge into a storm sewer.

(3) A portable building shall be rigidly constructed, ventilated by a screened opening or a vent having a cross-sectional area of at least 1 square foot per seat, and equipped with a floor, riser, and seat meeting the requirements of paragraph (b)(2) of this section or an equivalent individual stool and seat in prefabricated metal, fiber glass, plastic, or ceramic material.

(i) The structure shall provide privacy and protection from the elements.

(ii) An airtight seal shall be provided between the structure base and any pit, receptacle, or manhole over which it is placed.

(iii) Ventilation of the pit, receptacle, or manhole shall conform to paragraph (b)(1)(iv) of this section.

(4) A portable toilet shall be provided with facilities, requisite to its construction, for the removal of chemicals, ash, or residue. All surfaces subject to soiling shall be readily accessible and easily cleaned.

§ 1910.144 Safety color code for marking physical hazards.

(a) *Color identification*—(1) *Red.* Red shall be the basic color for the identification of:

(i) *Fire protection equipment and apparatus.* (*a*) Fire alarm boxes (pull boxes).

(*b*) Fire blanket boxes.

(*c*) Fire buckets or pails.

(*d*) Fire exit signs.

(*e*) Fire extinguishers (if painting the extinguisher is impractical or undesirable, color should be used on the housing, wall, or support to identify the location).

(*f*) Fire hose locations (color should be used on the reel, supports, or housing but not on the hose).

(*g*) Fire hydrants (industrial).

(*h*) Fire pumps.

(*i*) Fire sirens.

(*j*) Post indicator valves for sprinkler system (it is suggested that if a traffic hazard is involved, the top should be colored red, and the barrel or post yellow and black stripes).

(*k*) Sprinkler piping. (See ANSI Standard Scheme for the Identification of Piping Systems, A13.1–1956.)

(ii) *Danger.* Safety cans or other portable containers of flammable liquids having a flashpoint at or below 80° F, table containers of flammable liquids (open cup tester), excluding shipping containers, shall be painted red with some additional clearly visible identification either in the form of a yellow band around the can or the name of the contents conspicuously stenciled or painted on the can in yellow. Red lights shall be provided at barricades and at temporary obstructions, as specified in ANSI Safety Code for Building Construction, A10.2–1944. Danger signs shall be painted red.

(iii) *Stop.* Emergency stop bars on hazardous machines such as rubber mills, wire blocks, flat work ironers, etc., shall be red. Stop buttons or electrical switches used for emergency stopping of machinery shall be red.

(2) *Orange.* Orange shall be used as the basic color for designating dangerous parts of machines or energized equipment which may cut, crush, shock, or otherwise injure and to emphasize such hazards when enclosure doors are open or when gear belt, or other guards around moving equipment are open or removed, exposing unguarded hazards.

(3) *Yellow.* Yellow shall be the basic color for designating caution and for marking physical hazards such as: Striking against, stumbling, falling, tripping, and "caught in between." Solid yellow, yellow and black stripes, yellow and black checkers (or yellow with suitable contrasting background) should be used interchangeably, using the combination which will attract the most attention in the particular environment.

(4) *Green.* Green shall be used as the basic color for designating "Safety" and the location of first aid equipment (other than firefighting equipment).

(5) *Blue.* Blue shall be the basic color for designating caution, limited to warning against the starting, the use of, or the movement of equipment under repair or being worked upon.

(6) *Purple.* Purple shall be the basic color for designating radiation hazards. "Radiation" as used in this subparagraph refers to radiation types such as X-ray, alpha, beta, gamma, neutron, proton, deuteron, and meson. Yellow should be used in combination with purple for markers such as tags, labels, signs, and floor markers.

(7) *Black, white, or combinations of black and white.* Black, white, or a combination of these two, shall be the basic colors for the designation of traffic and housekeeping markings. Solid white, solid black, single color striping, alternate stripes of black and white, or black and white checkers should be used in accordance with local conditions.

(b) *Color specifications.* Colors shall meet the tests specified in section 3, Color Definitions, of ANSI Z53.1–1967, Safety Color Code for Marking Physical Hazards.

§ 1910.145 Specifications for accident prevention signs and tags.

(a) *Scope.* (1) These specifications apply to the design, application, and use of signs or symbols (as included in paragraphs (c) through (e) of this section) intended to indicate and, insofar as possible, to define specific hazards of a nature such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. These specifications are intended to cover all safety signs except those designed for streets, highways, railroads, and marine regulations. These specifications do not apply to plant bulletin boards or to safety posters.

(2) All new signs and replacements of old signs on or after August 31, 1971, shall be in accordance with these specifications.

(b) *Definitions.* As used in this section, the word "sign" refers to a surface on which letters or other markings appear, prepared for the warning of, or safety instructions of, industrial workers or members of the public who may be exposed to hazards. Excluded from this definition, however, are news releases, displays commonly known as safety posters, and bulletins used for employee education.

(c) *Classification of signs according to use*—(1) *Danger signs.* (i) Danger signs should be used only where an immediate hazard exists. There shall be no variation in the type of design of signs posted to warn of specific dangers and radiation hazards.

(ii) All employees shall be instructed that danger signs indicate immediate danger and that special precautions are necessary.

(2) *Caution signs.* (i) Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices.

(ii) All employees shall be instructed that caution signs indicate a possible hazard against which proper precaution should be taken.

(3) *Safety instruction signs.* Safety instruction signs shall be used where there is a need for general instructions and suggestions relative to safety measures.

(d) *Sign design and colors*—(1) *Design features.* The colors, proportions, and location of the identification panels on each sign shall be in accordance with this paragraph. All signs shall be furnished with rounded or blunt corners and shall be free from sharp edges, burrs, splinters, or other sharp projections. The ends or heads of bolts or other fastening devices shall be located in such a way that they do not constitute a hazard. When conditions warrant the use of a sign size not covered in the following tables, the ratio of the depth of the identifying panel (Danger, Caution, etc.) to the width of the sign shall be as established in Tables J-1 to J-4.

TABLE J-1—STANDARD PROPORTIONS FOR DANGER SIGNS

Sign size, inches Height Width	Black rectangular panel, inches Height Width	Red oval, inches Height Width	Word danger, height inches	Maximum space available for sign wording, inches
		HORIZONTAL PATTERN		
7 x 10	3¼ x 9⅜	2⅞ x 8½	1⁷⁄₁₆	2¾ x 9⅜
10 x 14	4⅝ x 13⅜	4⅛ x 11⅞	2¹⁄₁₆	4¼ x 13⅜
14 x 20	6½ x 19⅜	5¾ x 17	2⅞	6¾ x 19⅜
20 x 28	9¼ x 27⅜	8¼ x 23⅞	4⅛	9½ x 27⅜
		UPRIGHT PATTERN		
10 x 7	2⅜ x 6⅜	2⅛ x 5⅞	1¹⁄₁₆	6⅜ x 6⅜
14 x 10	3¼ x 9⅜	2⅞ x 8½	1⁷⁄₁₆	9½ x 9⅜
20 x 14	4⅝ x 13⅜	4⅛ x 11⅞	2¹⁄₁₆	14 x 13⅜
28 x 20	6½ x 19⅜	5¾ x 17	2⅞	20¼ x 19⅜

(2) *Danger signs.* (i) The colors red, black, and white shall be those of opaque glossy samples as specified in Table 1 of Fundamental Specification of Safety Colors for CIE Standard Source "C", American National Standard Z53.1–1967.

(ii) Standard Proportions shall be as indicated in Table J–1, and format shall be as in Fig. J–1.

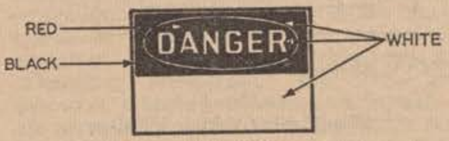


Fig. J-1
Danger Sign

(3) *Radiation warning signs.* (i) Standard color of the background shall be yellow; the panel, reddish purple with yellow letters; the symbol, reddish purple; any letters used against the yellow background shall be black. The colors shall be those of opaque glossy samples as specified in Table 1 of American National Standard, Z53.1–1967.

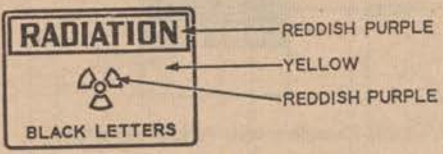


Fig.J-2
Radiation Warning Sign

(ii) The standard symbol shall be as in Figure J–3. Method of dimensioning, design, and orientation of the standard symbol (one blade pointed downward and centered on the vertical axis) shall be executed as illustrated. The symbol shall be prominently displayed, and of a size consistent with the size of the equipment or material or area to which it is attached.

(iii) Format shall be as in Figure J–2. Sign proportions shall be the same as those for danger signs in Table J–1.

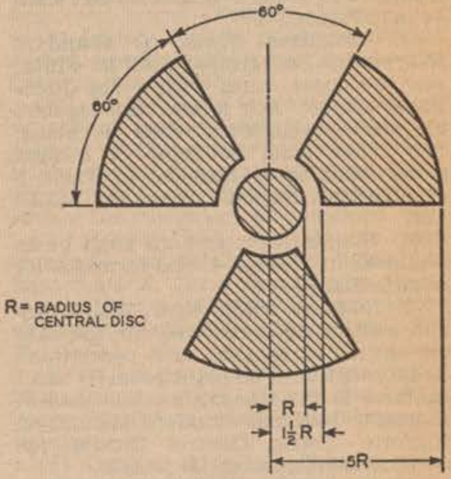


Fig. J-3
Standard Radiation Symbol

(4) *Caution signs.* (i) Standard color of the background shall be yellow; and the panel, black with yellow letters. Any letters used against the yellow background shall be black. The colors shall be those of opaque glossy samples as specified in Table 1 of American National Standard Z53.1–1967.

(ii) Standard proportions shall be as indicated in Table J–2, and format shall be as in Figure J–4.

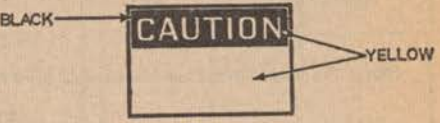


Fig. J-4
Caution Sign

TABLE J-2—STANDARD PROPORTIONS FOR CAUTION SIGNS

Sign size inches height width	Black rectangular panel, inches height width	Word "Caution" height of letter, inches	Maximum space available for sign wording below panel inches height width
	HORIZONTAL PATTERN		
7 x 10	2¼ x 9⅜	1⅝	3¼ x 9⅜
10 x 14	3¼ x 13⅜	2¼	5½ x 13⅜
14 x 20	3¾ x 19⅜	2¾	9 x 19⅜
20 x 28	4¼ x 27⅜	3¼	14½ x 27⅜
	UPRIGHT PATTERN		
10 x 7	1⅝ x 6⅜	1⅛	7 x 6⅜
14 x 10	2¼ x 9⅜	1⅝	10½ x 9⅜
20 x 14	3¼ x 13⅜	2¼	15½ x 13⅜
28 x 20	3¾ x 19⅜	2¾	24 x 19⅜

(5) *Exit signs.* Exit signs shall be in accordance with § 1910.37(q).

(6) *Safety instruction signs.* (i) Standard color of the background shall be white; and the panel, green with white letters. Any letters used against the white background shall be black. The colors shall be those of opaque glossy samples as specified in Table 1 of American National Standard, Z53.1–1967.

(ii) Standard proportions shall be as indicated in Table J–3, and format shall be as in Figure J–5.

(7) *Directional signs.* (i) Standard color of the background shall be white; and the panel, black with white directional symbol. Any letters used against the white background shall be black. The colors shall be those of opaque glossy samples as specified in Table 1 of American National Standard Z53.1–1967.

(ii) Standard proportions shall be as indicated in Table J–4, and format shall be as in Figure J–6.

(8) *In-Plant traffic signs.* Regulatory and control signs required for the safe movement of vehicles and pedestrians on thoroughfares on plant property shall conform to the standards established in American National Standard Manual on Uniform Traffic Control Devices for Streets and Highways, D6.1–1961.

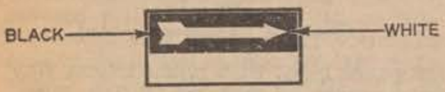
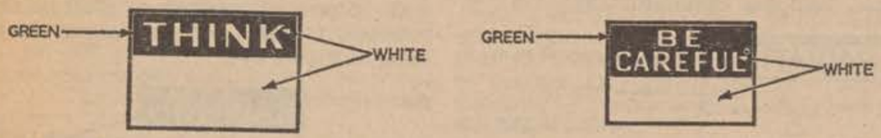


Fig. J-6
Directional Signs

(9) *Informational signs.* Blue shall be the standard color for informational signs. It may be used as the background color for the complete sign or as a panel at the top of such types of "Notice" signs, which have a white background. The colors shall be those of opaque glossy samples as specified in Table 1 of American National Standard Z53.1–1967.



(NOTE: The words "Think" and "Be Careful," given here, are only illustrations. Other wordings may be used.)

Fig. J-5
Safety Instruction Signs

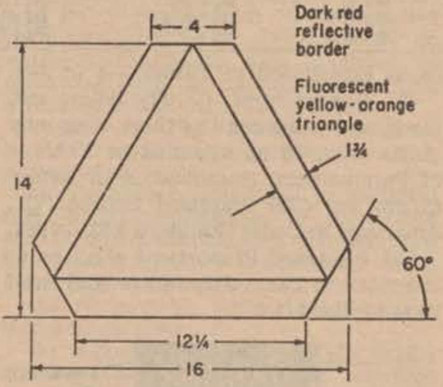
TABLE J-3—STANDARD PROPORTIONS FOR SAFETY INSTRUCTION SIGNS

Sign size, inches, height, width	Green rectangular panel, inches, height, width	Word "Think" height of letters, inches	Maximum space available for sign wording below panel, inches height, width	Sign size, inches height, width	Green panel, inches, height, width	Word "Be" height of letters, inches	Word "Careful" height of letters, inches	Maximum space available for sign wording below panel, inches, height, width
7 x 10	2¾ x 9⅜	1⅝	3½ x 9⅜	7 x 10	3⅜ x 9⅜	1¼	1 13/16	2½ x 9⅜
10 x 14	3¼ x 13⅜	2¼	5½ x 13⅜	10 x 14	4¾ x 13⅜	1¾	2 3/16	4 x 13⅜
14 x 20	3¾ x 19⅜	2¾	9 x 19⅜	14 x 20	6¾ x 19⅜	2½	3⅛	6 x 19⅜
20 x 28	4¼ x 27⅜	3¼	14½ x 27⅜	20 x 28	9½ x 27⅜	3½	4⅜	9¼ x 27⅜

Table J-4—Standard Proportions for Directional Signs

Sign size, inches height width	Black rectangular panel, inches height width	White arrow, inches				Maximum space for sign wording below panel height
		Overall length	Arrow head height width	Arrow shaft height	Arrow tail height width	
6½ x 14	3¼ x 13⅜	12⅝	2¾ x 3	1⅛	2⅜ x 3¼	2¼ x 13⅜
9 x 20	4½ x 19⅜	18⅝	3¾ x 4⅛	1⅝	3¼ x 4½	3⅜ x 19⅜
12 x 28	6 x 27⅜	26⅝	5⅛ x 5⅝	2⅛	4⅜ x 6	4¾ x 27⅜
15 x 36	7½ x 35⅜	34⅝	6⅜ x 6⅞	2⅝	5½ x 7½	6¼ x 35⅜

(10) *Slow-moving vehicle emblem.* This emblem (see fig. J–7) consists of a fluorescent yellow-orange triangle with a dark red reflective border. The yellow-orange fluorescent triangle is a highly visible color for daylight exposure. The reflective border defines the shape of the fluorescent color in daylight and creates a hollow red triangle in the path of motor vehicle headlights at night. The emblem is intended as a unique identification for, and it shall be used only on, vehicles which by design move slowly (25 m.p.h. or less) on the public roads. The emblem is not a clearance marker for wide machinery nor is it intended to replace required lighting or marking of slow-moving vehicles. Neither the color film pattern and its dimensions nor the backing shall be altered to permit use of advertising or other markings. The material, location, mounting, etc., of the emblem shall be in accordance with the American Society of Agricultural Engineers Emblem for Identifying Slow-Moving Vehicles, ASAE R276, 1967, or ASAE S276.2 (ANSI B114.1–1971).


4
Dark red reflective border
Fluorescent yellow-orange triangle
1¾
14
60°
12¼
16

NOTE: All dimensions are in inches.

Fig. J-7
Slow-Moving Vehicle Emblem

(11) *Symbols.* Symbols used on signs shall follow recognized practices, such as in Figure J–8. For radioactive materials, see symbol in Figure J–3.

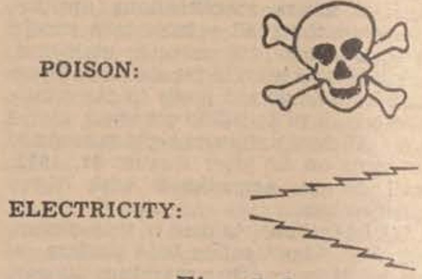


Fig. J-8
Symbols Used on Signs

(e) *Sign wordings*—(1) *Examples of wordings.* The lists in subparagraphs (3) through (7) of this paragraph are intended to serve as a guide for choosing the correct sign design for the message to be displayed.

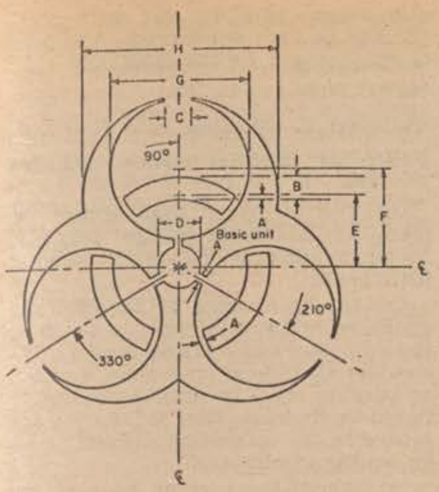
(2) *Nature of wording.* The wording of any sign should be easily read and concise. The sign should contain sufficient information to be easily understood. The wording should make a positive, rather than negative suggestion and should be accurate in fact.

(3) *Danger signs.*

Danger—Keep Off, Electric Current.
Danger—No Smoking, Matches, or Open Lights.
Danger—Men Working Above.
Danger—Not Room Enough Here to Clear Men on Cars.
Danger—Keep Away.
Danger—Men in Boiler.
Danger—Insufficient Clearance.
Danger—2,300 Volts.
Danger—Keep Out.
Danger—Crane Overhead.
Danger—Keep Off.

(4) *Biological hazard signs.* The biological hazard warning shall be used to signify the actual or potential presence of a biohazard and to identify equipment, containers, rooms, materials, experimental animals, or combinations thereof, which contain, or are contaminated with, viable hazardous agents. For the purpose of this subparagraph the term "biological hazard," or "biohazard," shall include only those infectious agents presenting a risk or potential risk to the well-being of man. The biohazard symbol shall be designed and proportioned as illustrated in figure J–9.

The symbol design shall be a fluorescent orange or orange-red color. Background color is optional as long as there is sufficient contrast for the symbol to be clearly defined. Appropriate wording may be used in association with the symbol to indicate the nature or identity of the hazard, name of individual responsible for its control, precautionary informa-



Dimension	A	B	C	D	E	F	G	H
Units	1	3½	4	6	11	15	21	30

Fig. J-9
Symbol for Biological Hazard

tion, etc., but never should this information be superimposed on the symbol.

(5) *Caution signs.*

Caution—Do Not operate, Men Working on Repairs.
Caution—Hands Off Switch, Men Working on Line.
Caution—Working on Machines, Do Not Start.
Caution—Goggles Must Be Worn When Operating This Machine.
Caution—This Door Must Be Kept Closed.
Caution—Electric Trucks, Go Slow.
Caution—This Space Must Be Kept Clear at All Times.
Caution—Stop Machinery to Clean, Oil, or Repair.
Caution—Keep Aisles Clear.
Caution—Operators of This Machine Shall Wear Snug Fitting Clothing—No Gloves.
Caution—Close Clearance.
Caution—Watch Your Step.
Caution—Electric Fence.

(6) *Safety instruction signs.*

Report All Injuries to the First-Aid Room at Once.
Walk—Don't Run.
Report All Injuries No Matter How Slight.
Think, If Safe Go Ahead.
Make Your Work Place Safe Before Starting the Job.
Report All Unsafe Conditions to Your Foreman.
Help Keep This Plant Safe and Clean.

(7) *Directional signs.*

This Way Out (below arrow panel).
This Way (inside arrow) Out (below arrow panel).
Fire Exit (below arrow panel).
Fire (inside arrow) Extinguisher (below arrow panel).
To the (inside arrow) Fire Escape (below arrow panel).
To the (inside arrow) First Aid (below arrow panel).
Manway (below arrow panel).
This Way to (inside arrow) First-Aid Room (below arrow panel).

(8) *Informational signs.*

No Trespassing Under Penalty of the Law.
This Elevator Is for Freight Only, Not for Passengers.
No Admittance Except to Employees on Duty.
No Admittance.
No Admittance, Apply at Office.
No Trespassing.
Men.
Women.
For Employees Only.
Office.

NOTE: When sign wordings such as those listed in this section are contemplated, care should be taken to be sure that they are suitable for the particular location at which the sign is to be placed and that wording meets the requirements of the intended purpose. When there is a reasonable doubt, a sign of a standard design should be used.

(f) *Accident prevention tags*—(1) *Scope and purpose.* (i) The tags are a temporary means of warning all concerned of a hazardous condition, defective equipment, radiation hazards, etc. The tags are not to be considered as a complete warning method, but should be used until a positive means can be employed to eliminate the hazard; for example, a "Do Not Start" tag on power equipment shall be used for a few moments or a very short time until the switch in the system can be locked out; a "Defective Equipment" tag shall be placed on a damaged ladder and immediate arrangements made for the ladder to be taken out of service and sent to the repair shop.

(ii) The purpose of this paragraph is to establish a set of specifications for tags based on experience and previous use. The tags are to be used in industry, mercantile establishments, or wherever such tags can be utilized to help prevent accidental injury to personnel or damage to property, or both.

(2) *Definitions.* The word "tag" as used in this paragraph refers to a surface (usually card, paper, pasteboard, or some temporary or nonpermanent material) on which letters or markings, or both, appear. These letters or markings, or both, are for warning (cautioning) or safety instruction of employees who may be exposed to hazards. They are to be affixed to the device in question by string, wire, or adhesive.

(3) *Do not start tags.* (i) The standard background color for Do Not Start tags shall be red. (See Fig. J-10.)

(ii) Letters shall be white or grey or etched, provided that a long lasting and sharp contrast results.

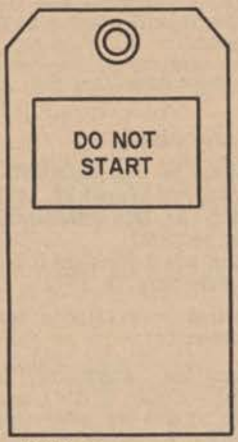
(iii) Do Not Start tags shall be placed in a conspicuous location or shall be placed in such a manner that they effectively block the starting mechanism which would cause hazardous conditions should the equipment be energized.

(4) *Danger tags.* (i) Danger tags should be used only where an immediate hazard exists. There should be no variation in the type of design of tags posted or hung to warn of specific dangers. (See Fig. J-11.)

(ii) All employees should be instructed that Danger tags indicate immediate danger and that special precautions are necessary.

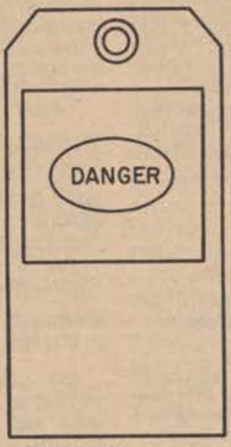
(5) *Caution tags.* (i) Caution tags should be used only to warn against potential hazards or to caution against unsafe practices. (See Fig. J-12.)

(ii) All employees should be instructed that Caution tags indicate a possible hazard against which proper precautions should be taken.



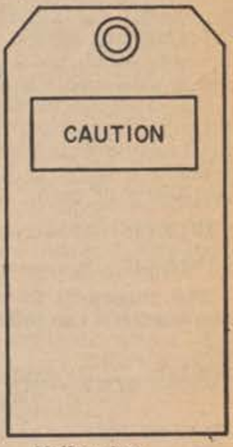
White tag
white letters on
red square

Fig. J-10
Do Not Start Tag



White tag
white letters on
red oval with a
black square

Fig. J-11
Danger Tag



Yellow tag
yellow letters on a
black background

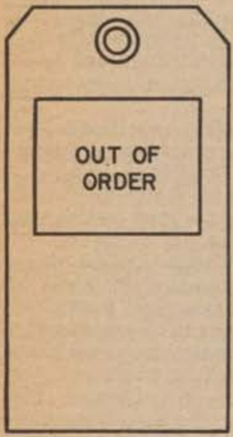
Fig. J-12
Caution Tag

(6) *Out of order tags.* Out of Order tags should be used only for the specific purpose of indicating that a piece of equipment, machinery, etc., is out of order and to attempt to use it might present a hazard. (See Fig. J-13.)

(7) *Radiation tags.* (i) The standard background for Radiation tags shall be yellow; the panel shall be reddish purple. Any letters used against the yellow background shall be black. The colors shall be those of opaque glossy samples as specified in Table 1, Fundamental Specification of Safety Colors for CIE Standard Source "C" American National Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1-1967.

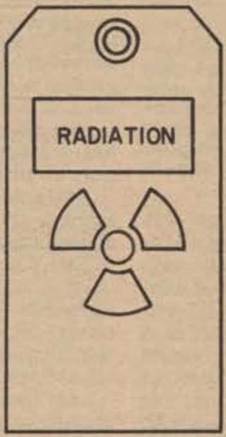
(ii) The method of dimension, design, and orientation of the standard symbol (one blade pointed downward and centered on the vertical axis) shall be executed as illustrated in Figure J-14. The symbol shall be prominently displayed and of a size consistent with the size of the equipment or area in which it is to be used.

(8) *Biological hazard tags.* (i) The standard background color for the Biological Hazard symbol is optional as long as there is sufficient contrast for the symbol to be clearly defined. The symbol design (see Fig. J-15) shall be a fluorescent orange or orange-red color.



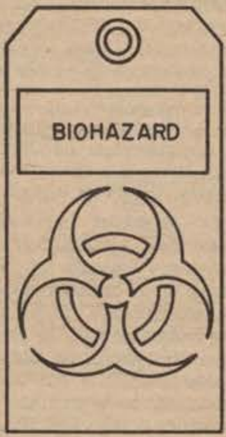
White tag
white letters on
black background

Fig. J-13
Out of Order Tag



Yellow tag
yellow letters in
reddish-purple panel
(Added wording in black
on yellow background)

Fig. J-14
Radiation Tag



White tag
black letters on
fluorescent-orange
background and
symbol

Fig. J-15
Biological Hazard Tag

(ii) The biological Hazard tag shall be used to signify the actual or potential presence of a biohazard, to identify equipment, containers, rooms, materials, experimental animals, or combinations thereof, which contain or are contaminated with viable hazardous agents.

(iii) For the purpose of this subparagraph the term "biological hazard" shall include only those infectious agents presenting a risk or potential risk to the well-being of man.

§ 1910.146 [Reserved]

§ 1910.147 Sources of standards.

The standards in this Subpart J are derived from the following sources:

Sec.	Source
1910.141	ANSI Z4.1–1968. Minimum Requirements for Sanitation in Places of Employment.
1910.142	ANSI Z4.4–1968, Minimum Requirements for Sanitation in Temporary Labor Camps.
1910.143	ANSI Z4.3–1970. Minimum requirements for Nonwater Carriage. Disposal Systems.
1910.144	ANSI Z53.1–1967, Safety Color Code for Marking Physical Hazards.
1910.145 (a)–(e)	ANSI Z35.1–1969. Specifications for Accident Prevention Signs, and ANSI B114.1–1971, Slow-Moving Vehicle Identification Emblem.
1910.145(f)	ANSI Z35.2–1968. Specifications for Accident Prevention Tags.

§ 1910.148 Standards organizations.

Standard and specifications of the following organizations have been referenced in this Subpart J:

American National Standards Institute, 1430 Broadway, New York, NY 10018.

National Association of Plumbing and Mechanical Officials, 5032 Alhambra Avenue, Los Angeles, CA 90032.

American Society of Agricultural Engineers, 2950 Niles Road, Post Office Box 229, St. Joseph, MI 49085.

§ 1910.149 Effective dates.

(a) The provisions of this Subpart J shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.142(b)(2), (b)(5), (b)(7), (d)(6), (f), (g), (i) (1) and (2).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in 50-204.2 (a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart J which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

[36 F.R. 15105, Aug. 13, 1971]

Subpart K—Medical and First Aid

§ 1910.151 Medical services and first aid.

(a) The employer shall ensure the ready availability of medical personnel for advice and consultation on matters of plant health.

(b) In the absence of an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees, a person or persons shall be adequately trained to render first aid. First aid supplies approved by the consulting physician shall be readily available.

(c) Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

§ 1910.152 [Reserved]

§ 1910.153 Sources of standards.

The standard in § 1910.151 is derived from 41 CFR 50-204.6.

Subpart L—Fire Protection

§ 1910.156 Definitions applicable to this subpart.

(a) "Class A fires" are fires in ordinary combustible materials, such as wood, cloth, paper, and rubber.

(b) "Class B fires" are fires in flammable liquids, gases, and greases.

(c) "Class C fires" are fires which involve energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance. (When electrical equipment is deenergized, extinguishers for Class A or B fires may be used safely.)

(d) "Class D fires" are fires in combustible metals, such as magnesium, titanium, zirconium, sodium, and potassium.

(e) Classification of portable fire extinguishers: "Portable fire extinguishers" are classified for use on certain classes of fires and rated for relative extinguishing effectiveness at a temperature of plus 70° F. by nationally recognized testing laboratories. This is based upon the preceding classification of fires and the fire extinguishment potentials as determined by fire tests.

NOTE: The classification and rating system described in this section is that used by Underwriters' Laboratories, Inc. and Underwriters Laboratories of Canada and is based on extinguishing preplanned fires of determined size and description as follows:

(i) Class A rating—Wood and excelsior fires excluding deep-seated conditions.

(ii) Class B rating—Two-inch depth gasoline fires in square pans.

(iii) Class C rating—No fire test. Agent must be a nonconductor of electricity.

(iv) Class D rating—Special tests on specific combustible metal fires.

(f) A "light hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of small size may be expected. These may include offices, schoolrooms, churches, assembly halls, telephone exchanges, etc.

(g) An "ordinary hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of moderate size may be expected. These may include mercantile storage and display, auto showrooms, parking garages, light manufacturing, warehouses not classified as extra hazard, school shop areas, etc.

(h) An "extra hazard" is a situation where the amount of combustibles or flammable liquids present is such that fires of severe magnitude may be expected. These may include woodworking, auto repair, aircraft servicing, warehouses with high-piled (14 feet or higher) combustibles, and processes such as flammable liquid handling, painting, dipping, etc.

(i) Sprinkler system: A "sprinkler system," for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply, such as a gravity tank, fire pump, reservoir, or pressure tank and/or connection by underground piping to a city main. The portion of the sprinkler system above ground is a network of specially sized or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which sprinklers are connected in a systematic pattern. The system includes a controlling valve and a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.

NOTE: The design and installation of water supply facilities such as gravity tanks, fire pumps, reservoirs, or pressure tanks, and underground piping are covered by NFPA Standards No. 22-1970, Water Tanks For Private Fire Protection; No. 20-1970, Installation of Centrifugal Fire Pumps and No. 24-1970, Outside Protection.

(j) Sprinkler alarms: A "sprinkler alarm" unit is an assembly of apparatus approved for the service and so constructed and installed that any flow of water from a sprinkler system equal to or greater than that from a single automatic sprinkler will result in an audible alarm signal on the premises.

(k) Class of service—standpipe systems: "Standpipe systems" are grouped into three general classes of service for the intended use in the extinguishment of fire.

(1) Class I: For use by fire departments and those trained in handling heavy fire streams (2½-inch hose).

(2) Class II: For use primarily by the building occupants until the arrival of the fire department (small hose).

(3) Class III: For use by either fire departments and those trained in handling heavy hose streams or by the building occupants.

(l) Class I service: "Class I service" is a standpipe system capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings or for exposure fire.

(m) Class II service: "Class II service" is a standpipe system which affords a ready means for the control of incipient fires by the occupants of buildings during working hours and by watchmen and those present during the night time and holidays.

(n) Class III service: "Class III service" is a standpipe system capable of furnishing the effective fire streams required during the more advanced stages of fire on the inside of buildings as well as providing a ready means for the control of fires by the occupants of the building.

(o) Standpipe systems: "Standpipe systems" are usually of the following types:

(1) A wet standpipe system having a supply valve open and water pressure maintained at all times.

(2) A standpipe system so arranged through the use of approved devices as to admit water to the system automatically by opening a hose valve.

(3) A standpipe system arranged to admit water to the system through manual operation of approved remote control devices located at each hose station.

(4) Dry standpipe having no permanent water supply.

See also paragraph (k) of this section.

(p) Type I storage: "Type I storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored over 15 feet but not more than 21 feet high in solid piles or over 12 feet but not more than 21 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(q) Type II storage: "Type II storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored not over 15 feet high in solid piles or not over 12 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(r) Type III storage: "Type III storage" is that in which the stored commodities, packaging, and storage aids are noncombustible or contain only a small concentration of combustibles which are incapable of producing a fire that would cause appreciable damage to the commodities stored or to noncombustible wall, floor or roof construction. Ordinary combustible commodities in completely sealed noncombustible containers may qualify in this classification. General commodity storage that is subject to frequent changing and storage of combustible packaging and storage aids is excluded from this category.

(s) "Approved": "Approved" means listed or approved by: (1) At least one of the following nationally recognized testing laboratories: Factory Mutual Engineering Corp.; Underwriters' Laboratories, Inc., or (2) Federal agencies such as Bureau of Mines, Department of the Interior: Department of Transportation; or U.S. Coast Guard, which issue approvals for such equipment.

PORTABLE FIRE SUPPRESSION EQUIPMENT

§ 1910.157 Portable fire extinguishers.

(a) *General requirements*—(1) *Operable condition.* Portable extinguishers shall be maintained in a fully charged and operable condition, and kept in their designated places at all times when they are not being used.

(2) *Location.* Extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. They shall be located along normal paths of travel.

(3) *Marking of location.* Extinguishers shall not be obstructed or obscured from view. In large rooms, and in certain locations where visual obstruction cannot be completely avoided, means shall be provided to indicate the location and intended use of extinguishers conspicuously.

(4) *Marking of extinguishers.* If extinguishers intended for different classes of fire are grouped, their intended use shall be marked conspicuously to insure choice of the proper extinguisher at the time of a fire.

(5) *Mounting of Extinguishers.* Extinguishers shall be installed on the hangers or in the brackets supplied, mounted in cabinets, or set on shelves unless the extinguishers are of the wheeled type.

(6) *Height of mounting.* Extinguishers having a gross weight not exceeding 40 pounds shall be installed so that the top of the extinguisher is not more than 5 feet above the floor. Extinguishers having a gross weight greater than 40 pounds (except wheeled types) shall be so installed that the top of the extinguisher is not more than 3½ feet above the floor.

(7) *Cabinet mounting.* Extinguisher mounted in cabinets or wall recesses or set on shelves shall be placed in a manner such that the extinguisher operating instructions face outward. The location of such extinguishers shall be marked conspicuously.

(8) *Vibrating locations.* Extinguishers installed under conditions where they are subject to severe vibration shall be installed in brackets specifically designed to cope with this vibration.

(9) *Temperature range.* Extinguishers shall be suitable for use within a temperature range of at least plus 40° to 120° Fahrenheit.

(10) *Extreme temperature exposure.* When extinguishers are installed in locations subjected to temperatures outside the range prescribed in this subparagraph, they shall be of a type approved or listed for the temperature to which they will be exposed, or placed in an enclosure capable of maintaining the temperature within the range prescribed in this subparagraph.

(b) *Selection of extinguishers*—(1) *General.* The selection of extinguishers for a given situation will depend upon the character of the fires anticipated, the construction and occupancy of the individual property, the vehicle or hazard to be protected, ambient-temperature conditions, and other factors. The number of extinguishers required shall be determined by reference to paragraph (c) of this section.

(2) *Selection by hazard.* (i) Extinguishers shall be selected for the specific class or classes of hazards to be protected in accordance with the following paragraphs.

(ii) Extinguishers for protecting Class A hazards shall be selected from among the following: foam, loaded stream, multipurpose dry chemical, and water types. Certain smaller extinguishers which are charged with multipurpose dry chemical are rated on Class B and Class C fires, but have insufficient effectiveness to earn the minimum 1–A rating even though they have value in extinguishing smaller Class A fires.

Such smaller extinguishers shall not be used to meet the requirements of paragraph (c)(2)(i) of this section.

(iii) Extinguishers for protection of Class B hazards shall be selected from the following: bromotrifluoromethane, carbon dioxide, dry chemical, foam, loaded stream, and multipurpose dry chemical. Extinguishers with ratings less than 1–B shall not be considered in determining suitability.

(iv) Extinguishers for protection of Class C hazards shall be selected from the following: bromotrifluoromethane, carbon dioxide, dry chemical, and multipurpose dry chemical.

NOTE: Carbon dioxide extinguishers equipped with metal horns are not considered safe for use on fires in energized electrical equipment and, therefore, are not classified for use on Class C hazards.

(v) Extinguishers and extinguishing agents for the protection of Class D hazards shall be of types approved for use on the specific combustible-metal hazard.

(c) *Distribution of portable fire extinguishers*—(1) *General.* (i) The number of fire extinguishers needed to protect a property shall be determined as prescribed herein, considering the area and arrangement of the building or occupancy, the severity of the hazard, the anticipated classes of fires, and the distances to be traveled to reach extinguishers.

(ii) Fire extinguishers shall be provided for the protection of both the building structure, if combustible and the occupancy hazards contained therein.

(iii) Required building protection shall be provided by fire extinguishers suitable for Class A fires.

(iv) Occupancy hazard protection shall be provided by fire extinguishers suitable for such Class A, B, C, or D fire potentials as may be present.

(v) Extinguishers provided for building protection may be considered also for the protection of occupancies having a Class A fire potential.

(vi) Combustible buildings having an occupancy hazard subject to Class B, and/or Class C fires, shall have a standard complement of Class A fire extinguishers as required by Table L–1 for building protection, plus additional Class B and/or Class C extinguishers. Where fire extinguishers have more than one letter classification (such as 2–A: 20–B:C), they may be considered to satisfy the requirements of each letter class.

(vii) Rooms or areas shall be graded generally as light hazard, ordinary hazard, or extra hazard. Limited areas of greater or lesser hazard shall be protected as required.

(2) *Fire extinguisher size and placement for Class A hazards.* (i) Minimal sizes of fire extinguishers for the listed grades of hazard shall be provided on the basis of Table L–1. Extinguishers shall be located so that the maximum travel distances shall not exceed those specified in Table L–1.

TABLE L–1

Basic minimum extinguisher rating for area specified	Maximum travel distances to extinguishers (feet)	Areas to be protected per extinguisher		
		Light hazard occupancy (square feet)	Ordinary hazard occupancy (square feet)	Extra hazard occupancy (square feet)
1A	75	3,000	Note 1	Note 1
2A	75	6,000	3,000	Note 1
3A	75	9,000	4,500	3,000
4A	75	11,250	6,000	4,000
6A	75	11,250	9,000	6,000

NOTE 1: Not permitted except as specified in subdivision (ii) of this subparagraph.

(ii) The protection requirements specified in Table L–1 may be fulfilled by several extinguishers of lower ratings for ordinary or extrahazard occupancies.

(iii) Where the floor area of a building is less than that specified in Table L–1, at least one extinguisher of the minimum size recommended shall be provided.

(iv) The protection requirements may be fulfilled with extinguishers of higher rating provided the travel distance to such larger extinguishers shall not exceed 75 feet.

(3) *Fire extinguisher size and placement for Class B fires other than for fires in flammable liquids of appreciable depth.* (i) Minimal sizes of fire extinguishers for the listed grades of hazard shall be provided on the basis of Table L–2. Extinguishers shall be located so that the maximum travel distances shall not exceed those specified in Table L–2.

TABLE L–2

Type of hazard	Basic minimum extinguisher rating	Maximum travel distance to extinguishers (feet)
Light	4B	50
Ordinary	8B	50
Extra	12B	50

NOTE: Where this section calls for minimum extinguisher ratings of 4–B, 8–B, or 12–B, the requirements may be met by existing extinguishers of multiple foam extinguishers as allowed by paragraph (c)(3)(ii) of this section. However, if a single extinguisher must be purchased to fulfill such requirements, the next higher rating shall be used.

(ii) Two or more extinguishers of lower rating, except for foam extinguishers, shall not be used to fulfill the protection requirements of Table L–2. Up to three foam extinguishers may be used to fulfill these requirements.

(iii) The protection requirements may be fulfilled with extinguishers of higher ratings provided the travel distance to such larger extinguishers shall not exceed 50 feet.

(4) *Fire extinguisher size and placement for Class B fires in flammable liquids of appreciable depth.* (i) For flammable liquid hazards of appreciable depth (Class B), such as in dip or quench tanks, Class B fire extinguishers shall be provided on the basis of one numerical unit of Class B extinguishing potential per square foot of flammable liquid surface of the largest tank hazard within the area.

NOTE: Appreciable depth is defined as a depth of a liquid greater than one-quarter inch.

(ii) Two or more extinguishers of lower ratings except for foam extinguishers, shall not be used in lieu of the extinguisher required for the largest tank. Up to three foam extinguishers may be used to fulfill these requirements.

(iii) Scattered or widely separated hazards shall be individually protected if the specified travel distances in subdivisions (i) and (iii) of subparagraph (5) of this paragraph (c) are exceeded. Likewise, extinguishers in the proximity of a hazard shall be carefully located so as to be accessible in the presence of a fire without undue danger to the operator.

(5) *Fire extinguisher size and placement for Class C hazards.* (i) Extinguishers with Class C ratings shall be required where energized electrical equipment may be encountered which would require a nonconducting extinguishing media. This will include fire either directly involving or surrounding electrical equipment. Since the fire itself is a Class A or Class B hazard the extinguishers are sized and located on the basis of the anticipated Class A or B hazard.

(d) *Inspection, maintenance, and hydrostatic tests*—(1) *General.* (i) The employer shall be responsible for such inspection, maintenance, and testing.

(ii) For details of conducting needed inspections, proper maintenance operations, and required tests, see NFPA No. 10A–1970, Maintenance and Use of Portable Fire Extinguishers.

(2) *Inspection.* (i) Extinguishers shall be inspected monthly, or at more frequent intervals when circumstances require, to insure they are in their designated places, to insure they have not been actuated or tampered with, and to detect any obvious physical damage, corrosion, or other impairments.

(ii) Any extinguishers showing defects shall be given a complete maintenance check.

(3) *Maintenance.* (i) At regular intervals, not more than 1 year apart, or when specifically indicated by an inspection, extinguishers shall be thoroughly examined and/or recharged or repaired to insure operability and safety; or replaced as needed.

(ii) Extinguishers removed from the premises to be recharged shall be replaced by spare extinguishers during the period they are gone.

(iii) Pails or drums of powder-extinguishing agents for scoop or shovel application to metal fires shall be kept full at all times.

(iv) Each extinguisher shall have a durable tag securely attached to show the maintenance or recharge date and the initials or signature of the person who performs this service.

(4) *Hydrostatic tests.* (i) If, at any time, an extinguisher shows evidence of corrosion or mechanical injury, it shall be subjected to a hydrostatic pressure test, or replaced.

(ii) For evaluating the condition of extinguisher cylinders made to Department of Transportation specifications (cf. 49 CFR Chapter I), see the Standard for Visual Inspection of Compressed Gas Cylinders (CGA C-6), published by the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.

(iii) At intervals not exceeding those specified in Table L-3 and subdivision (iv) of this subparagraph, extinguishers shall be hydrostatically tested. The first hydrostatic retest may be conducted between the fifth and sixth years for those with a designated test interval of 5 years.

TABLE L-3

HYDROSTATIC TEST INTERVAL FOR EXTINGUISHERS

Extinguisher type:	*Test interval year*
Soda-acid	5
Cartridge-operated water and/or antifreeze	5
Storage-pressure water and/or antifreeze	5
Wetting agent	5
Foam	5
Loaded stream	5
Dry chemical extinguishers with stainless steel shells, aluminum shells, or soldered-brass shells	5
Carbon dioxide extinguishers	5
Dry chemical extinguishers with brazed-brass shells, or mild-steel shell	12
Bromotrifluoromethane	12
Dry powder extinguishers for metal fires	12

NOTE: Cylinders under jurisdiction of the U.S. Department of Transportation (formerly Interstate Commerce Commission) may require hydrostatic testing at more frequent periods.

(iv) Nitrogen cylinders (or other cylinders used for inert-gas storage), such as found on wheeled extinguishers, shall be tested at a 5-year interval.

(v) On those extinguishers which are equipped with a shutoff nozzle at the outlet end of the hose, a hydrostatic test shall be performed on the hose with its couplings (but without the discharge nozzle) at the test interval specified for the unit on which the hose is installed.

(vi) The test pressure for dry chemical and dry powder hose assemblies requiring a hydrostatic test shall be at a test pressure of 300 pounds per square inch for a 1-minute period. Carbon dioxide hose assemblies requiring a hydrostatic test shall be at test pressure of 1,250 p.s.i. for a 1-minute period.

(vii) Hydrostatic tests are not required on fire pails, pump-type water and/or antifreeze extinguishers, and factory-sealed disposable (nonrefillable) containers. If such an extinguisher or water pail shows evidence of corrosion or mechanical injury, it may be unsafe or unsuitable for further use and shall be replaced with a new unit.

(viii) The hydrostatic test date shall be recorded on a record tag of metal or equally durable material, or a suitable metallized decal which shall be affixed (by a heatless process) to the shell of an extinguisher which favorably passes the hydrostatic test. The record tag shall contain the following information: Date of test, test pressure, and name or initials of person or agency making the test.

(ix) For extinguishers subjected to an original factory test pressure of 350 p.s.i. or greater, the test pressure shall be 75 percent of the factory test pressure (as noted on the extinguisher nameplate), but in no case less than 300 p.s.i., see Table L-4. For extinguishers subjected to an original factory test pressure of less than 350 p.s.i., the test pressure shall be 75 percent of the factory test pressure; see Table L-4. Pressure shall be applied at a rate of rise to reach the test pressure in approximately 1 minute, and the pressure shall be held for 1 minute, after which it shall be released.

TABLE L-4

HYDROSTATIC TEST PRESSURE REQUIREMENTS—NON-ICC SHELLS, SHELLS NOT SPECIFIED IN U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS, (FORMERLY INTERSTATE COMMERCE COMMISSION)

Extinguisher type	Original factory test pressure	Requires hydrostatic test pressure
All dry chemical and dry powder.	400 p.s.i. or greater.	75% of factory test pressure.
	350-399 p.s.i.	300 p.s.i.
	below 350 p.s.i.	75% of factory test pressure.
Foam—500 p.s.i. factory test.	500	375.
Foam—350 p.s.i. factory test.	350	300.
Soda-acid—500 p.s.i. factory test.	500	375.
Soda-acid—350 p.s.i. factory test.	350	300.
Stored-pressure or cartridge-operated water-type (including antifreeze and loaded-stream).	400 p.s.i. or greater.	75% of factory test pressure.
	350-399 p.s.i.	300 p.s.i.
	below 350.	75% of factory test pressure.

(x) Carbon dioxide extinguishers, nitrogen cylinders, and other cylinders or cartridges used for the storage of inert, compressed gases shall be hydrostatically tested in accordance with the requirements of the U.S. Department of Transportation (formerly Interstate Commerce Commission); see 49 CFR Parts 171-190.

(xi) Extinguisher shells, cartridges, or cylinders which show leakage or permanent distortion in excess of specified limits, or which rupture, shall be removed from service.

§ 1910.158 Standpipe and hose systems.

(a) *General requirements*—(1) *Application.* Where standpipe and hose systems are provided they shall meet the design requirements of the National Fire Protection Association's Standard for the Installation of Standpipe and Hose Systems NFPA 14-1970 and the requirements of this section.

(2) *Closets and cabinets.* Closets and cabinets used to contain fire hose shall be of sufficient size to permit the installation of the necessary equipment at hose stations, and so designed as not to interfere with the prompt handling of the hose and equipment at time of fire. They shall be used for fire equipment only.

(3) *Protection of standpipes.* Standpipes shall be so located that they are protected against mechanical and fire damage.

(b) *Hose outlets*—(1) *Location of hose.* (i) Hose outlets shall be within easy reach of a person standing on the floor and in no case shall be over 6 feet from the floor. Hose stations shall be located conspicuously within the immediate area and where not likely to be obstructed. Hose may be located at one side of the standpipe and supplied by short lateral connections to the standpipe where necessary to avoid obstructions.

(ii) For Class III service, the outlets for large hose shall be located in a stairway enclosure, and for small hose the outlets shall be located in the corridor or space adjacent to the stairway enclosure.

(2) *Hose connections.* (i) Standpipes for Class I service shall be provided with 2½-inch hose connections on each floor.

(ii) Standpipes for Class II service shall be provided with 1½-inch hose connections on each floor.

(iii) Standpipes for Class III service shall be provided with both a 2½-inch and 1½-inch hose connection on each floor. The hose connections may be through one 2½-inch hose valve and an easily removable 2½-inch by 1½-inch adapter.

(3) *Hose.* Each hose outlet provided for the use of building occupants (Class II and III services) shall be equipped with not more than 75 feet and preferably not more than 50 feet of approved small fire hose attached and ready for use.

(4) *Hose racks.* Each station provided with small hose shall be equipped with an approved rack securely fastened in position.

(5) *Hose valves.* (i) An approved hose valve shall be provided at each outlet for attachment of hose.

(ii) Where the static pressure at any standpipe outlet for small hose exceeds 100 pounds per square inch, an approved device shall be installed at the outlet to reduce the pressure so that the nozzle pressure will be approximately 80 pounds per square inch.

NOTE: Pressure reducers are not required on standpipe outlets for 2½-inch hose because it is assumed 2½-inch hose will be attached only when the persons likely to use it are trained in handling large streams.

(iii) National (American) Standard Fire Hose Coupling Screw Threads shall be used whenever they will fit existing equipment; see Standard for Screw Threads Gaskets for Fire Hose Couplings, NFPA No. 194–1968.

(6) *Nozzles.* Nozzles shall be of an approved type. Size of nozzles for small hose shall be not larger than one-half inch.

(7) *Dry standpipe identification.* Each hose connection on dry standpipes shall be provided with a conspicuous, durable, and permanently legible sign reading "Dry Standpipe for Fire Department Use Only."

(c) *Water supplies*—(1) *Minimum supply for Class I service.* (i) The minimum supply for Class I service shall be sufficient to provide 500 gallons per minute for a period of at least thirty (30) minutes.

(ii) Where more than one standpipe is required, the minimum supply shall be 500 gallons per minute for the first standpipe and 250 gallons per minute for each additional standpipe, the total supply not to exceed 2,500 gallons a minute, for a period of at least thirty (30) minutes.

(iii) The supply shall be sufficient to maintain a residual pressure of 65 pounds per square inch at the topmost outlet of each standpipe (including the roof outlet) with 500 gallons per minute flowing.

(2) *Minimum supply for Class II service.* The minimum supply for Class II service shall be sufficient to provide 100 gallons per minute for a period of at least thirty (30) minutes. The supply shall be sufficient to maintain a residual pressure of 65 pounds per square inch at the topmost outlet of each standpipe (including the roof outlet) with 100 gallons per minute flowing.

(3) *Minimum supply for Class III service.* The minimum supply for Class III service shall be the same as for Class I service.

(4) *Fire department connections.* (i) One or more fire department connections shall be provided for each Class I or Class III standpipe system.

(ii) In high-rise buildings having two or more zones, a fire department connection shall be provided for each zone.

(iii) Fire department connections shall be properly supported.

(iv) There shall be no shutoff valve in the fire department connection.

(v) An approved straightway check valve shall be installed in each fire department connection, located as near as practicable to the point where it joins the system.

(vi) The pipe between the check valve and the outside hose coupling shall be equipped with an approved automatic drip, arranged to discharge to a proper place.

(vii) Hose connections shall be approved type and shall be equipped with standard caps, properly secured and arranged for easy removal by fire departments.

(viii) Hose coupling threads shall conform to those used by the local fire department. (American) National Standard Fire-Hose Coupling Screw Threads shall be used whenever they will fit the local fire department hose threads; see standard for Screw Threads and Gaskets for Fire Hose Couplings, NFPA No. 194—1968.

(ix) Hose connections should be on the street side of buildings and shall be located and arranged so that hose lines can be readily and conveniently attached to the inlets without interference from any nearby objects including buildings, fences, posts, or other fire department connections.

(x) Hose connections shall be designated by a sign having raised letters at least one inch in size cast on a plate or fitting, reading "Standpipe."

(xi) If hose connection does not serve all of the building an appropriate and durable sign shall be attached indicating the portions of the building served.

(d) *Tests and maintenance*—(1) *Tests.* All new systems including yard piping shall be tested hydrostatically at not less than 200 pounds per square inch pressure for 2 hours, or at 50 pounds per square inch in excess of the normal pressure when the normal pressure is in excess of 150 pounds per square inch.

(2) *Periodic inspection.* (i) The tanks shall be kept properly filled, and where pressure tanks are employed, a pressure of at least 75 pounds per square inch shall be maintained at all times.

NOTE: For further details, see Standard for Water Tanks for Private Fire Protection, NFPA No. 22–1970.

(ii) The valves in the main connection to the automatic sources of water supply shall be open at all times. The hose valves should be frequently examined to see that they are tight.

NOTE: For further details, see Care of Fire Hose, NFPA No. 198–1969.

FIXED FIRE SUPPRESSION EQUIPMENT

§ 1910.159 Automatic sprinkler systems.

(a) *General requirements*—(1) *Design.* When automatic sprinkler systems are provided they shall meet design requirements of the National Fire Protection Association's Standard for the Installation of Sprinkler Systems NFPA No. 13–1969 and the requirements of this section.

(2) *Water supply.* Every automatic sprinkler system shall have at least one automatic water supply of adequate pressure, capacity and reliability.

(3) *Fire department connection.* A connection through which a fire department can pump water into the sprinkler system makes a desirable auxiliary supply. For this purpose, one or more fire department connections shall be provided in all cases.

(b) *Fire department connections*—(1) *Size.* Pipe size shall not be less than 4 inches for fire engine connections and not less than 6 inches for fireboat connections, except that 3-inch pipe may be used to connect a single hose connection to a 3-inch or smaller riser.

(2) *Valves.* (i) An approved straightaway check valve shall be installed in each fire department connection, located as near as practicable to the point where it joins the system.

(ii) There shall be no shutoff valve in the fire department connection.

(3) *Support.* Fire department connections shall be properly supported.

(4) *Hose connections.* (i) Hose connections shall be of approved type.

(ii) Hose coupling threads shall conform to those used by the local fire department. National (American) Standard Fire Hose Coupling Screw Threads shall be used whenever they will fit the local fire department hose.

(iii) Hose connections shall be equipped with caps, properly secured and arranged for easy removal by fire departments.

(iv) Hose connections shall be located and arranged so that hose lines can be readily and conveniently attached to the inlets without interference from any nearby objects including buildings, fences, posts, or other fire department connections.

(v) Hose connections shall be designated by a sign having raised letters at least 1 inch in size cast on plate or fitting reading for service designated: Viz—"AUTO-SPKR." or "OPEN SPKR."

(c) *Sprinkler alarms*—(1) *General.* (i) Waterflow alarms shall be provided on all sprinkler installations.

(ii) An alarm unit shall include an approved mechanical alarm, horn, or siren, or an approved weatherproof electric gong, bell, horn, or siren on the outside of the building or approved electric gongs, bells, horns, or sirens inside the building, or a combination of such devices.

(iii) All alarm apparatus shall be so located and installed that all parts are readily accessible for inspection, removal, and repair, and shall be substantially supported. Outdoor mechanical or electrically operated bells shall be of weatherproof and guarded type. On each alarm check valve used under conditions of variable water pressure, a retarding device shall be installed. Suitable valves shall be provided in the connections to retarding chambers, to permit repair or removal without shutting off sprinklers; these valves shall be so arranged that they may be locked or sealed in the open position.

(2) *Waterflow detecting devices.* (i) The alarm apparatus for a wet-pipe system shall consist of an approved alarm check valve or other approved water flow detecting alarm device with the necessary attachments required to give an alarm.

(ii) The alarm apparatus for a dry-pipe system shall consist of approved alarm attachments to the dry-pipe valve. When a dry-pipe valve is located on the system side of an alarm valve, the actuating device of the alarms for the dry-pipe valve may be connected to the alarms on the wet-pipe system.

(iii) The alarm apparatus for preaction and deluge systems shall consist of approved electric alarm attachments, actuated by a thermostatic system independently of flow of water in the system.

(3) *Drains.* Drains from alarm devices shall be so arranged that there will be no danger of freezing, and so that there will be no overflowing at the alarm appa-

ratus, at domestic connections or elsewhere with the sprinkler drains wide open and under pressure.

(d) *Maintenance of sprinkler system.* A sprinkler system installed under this Standard must be properly maintained for efficient service. The employer is responsible for the condition of his sprinkler system and must use due diligence in keeping the system in good operating condition.

(e) *Sprinkler head clearance*—(1) *Type I storage.* Clearance of at least 36 inches shall be maintained between sprinkler deflectors and top of storage to reduce the possibility of obstruction to the distribution of water.

(2) *Type II storage.* Clearance of at least 18 inches shall be maintained between sprinkler deflectors and top of storage to reduce the possibility of obstruction to the distribution of water.

(3) *Type III storage.* In sprinklered buildings, at least 18 inches clearance between sprinkler deflectors and top of storage shall be maintained.

§ 1910.160 Fixed dry chemical extinguishing systems.

(a) *General requirements*—(1) *Design.* When dry chemical extinguishing systems are provided they shall meet the design requirements of the National Fire Protection Association's "Standard for Dry Chemical Extinguishing Systems" NFPA No. 17–1969 and the requirements of this section.

(2) *Safety requirements.* Where there is a possibility that personnel may be exposed to a dry chemical discharge, suitable safeguards shall be provided to insure prompt evacuation of such locations, and also to provide means for prompt rescue of any trapped personnel.

(b) *Alarms and indicators*—(1) *General.* Alarms and/or indicators are used to indicate the operation of the system, hazard to personnel, or failure of any supervised device or equipment. The devices may be audible or visual. The type, number, and location of the devices shall be such that their purpose is satisfactorily accomplished. The extent and type of alarm and/or indicator equipment shall be approved.

(2) *Operation alarm.* (i) An alarm or indicator shall be provided to show that the system has operated, that personnel response may be needed, and that the system should be charged.

(ii) Alarms indicating failure of supervised devices or equipment shall give prompt and positive indication of any failure and shall be distinctive from alarms indicating operation or hazardous conditions.

(c) *Inspection and maintenance*—(1) *Inspection and tests.* (i) At least annually, all dry chemical systems including alarms, shutdowns, and other associated equipment, shall be thoroughly inspected and checked for proper operation by a competent inspector.

(ii) The purpose of the inspection and testing prescribed by paragraph (c) of this section shall be not only to insure that the system is in full operating condition but also to indicate the probable continuance of that condition until the next inspection. Attention at this inspection shall be given to any extension of the hazard protected by the system.

(iii) The inspector's report, with recommendations, if any, shall be filed with the employer or with whomever is designated by the employer.

(iv) Between the regular service contract inspection or tests, the system shall be inspected visually or otherwise by competent personnel, following an approved schedule.

(v) At least semiannually, all expellant gas containers shall be checked by pressure or weight against the required minimums.

(vi) At least semiannually, all stored pressure dry chemical containers shall be checked by pressure and weight against the required minimums.

(vii) Except for stored pressure systems, at least annually the dry chemical in the system storage container shall be sampled from the top center and also near the wall to determine the existence of lumps harder than will be friable when dropped from a height of 4 inches.

(2) *Maintenance.* (i) These fixed dry chemical systems shall be maintained in full operating condition at all times. Use, impairment, and restoration of this protection shall be reported promptly to the employer.

(ii) Any troubles or impairments shall be corrected at once by competent personnel.

§ 1910.161 Carbon dioxide extinguishing systems.

(a) *General requirements*—(1) *Design.* When carbon dioxide extinguishing systems are provided they shall meet the design requirements of the National Fire Protection Association's "Standard on Carbon Dioxide Extinguishing Systems" NFPA No. 12–1968 and the requirements of this section.

(2) *Safety requirements.* In any use of carbon dioxide where there is a possibility that employees may be trapped in, or enter into atmospheres made hazardous by a carbon dioxide discharge, suitable safeguards shall be provided to insure prompt evacuation of and to prevent entry into such atmospheres and also to provide means for prompt rescue of any trapped personnel. Such safety items as personnel training, warning signs, discharge alarms, predischarge alarms, and breathing apparatus shall be considered.

(b) *Inspection and maintenance*—(1) *Inspection and tests.* (i) At least annually, all carbon dioxide systems shall be thoroughly inspected and tested for proper operation by a competent engineer or inspector.

(ii) The goal of this inspection and testing shall be not only to insure that the system is in full operating condition but shall indicate the probable continuance of that condition until the next inspection.

(iii) Suitable discharge tests shall be made when any inspection indicates their advisability.

(iv) Between the regular service contract inspection or tests, the system shall be inspected visually or otherwise by competent personnel, following a schedule.

(v) At least semiannually, all high pressure cylinders shall be weighed. If, at any time, a container shows a loss in net content of more than 10 percent, it shall be refilled or replaced.

(vi) If, at any time, a low pressure container shows a loss of more than 10 percent, it shall be refilled, unless the minimum gas requirements are still provided.

(2) *Maintenance.* (i) These carbon dioxide systems shall be maintained in full operating condition at all times.

(ii) Any troubles or impairments shall be corrected at once by competent personnel.

§ 1910.162 Other special fixed extinguishing systems. [Reserved]

OTHER FIRE PROTECTION SYSTEMS

§ 1910.163 Local fire alarm signaling systems.

(a) *General requirements.* Where local fire alarm signaling systems are provided they shall meet the design requirements of the National Fire Protection Association's "Standard for the Installation, Maintenance, and Use of Local Protective Signaling Systems for Watchman, Fire Alarm and Supervisory Service." NFPA No. 72A–1967 and the requirements of this section.

(b) *Fire alarm boxes*—(1) *General.* Manual fire alarm boxes shall be approved for the particular application and shall be used only for fire protective signaling purposes. Combined fire alarm and watchman's signaling boxes are acceptable.

(2) *Mounting.* Each box shall be securely mounted.

(3) *Distribution.* Manual fire alarm boxes shall be distributed throughout the protected area so that they are unobstructed, readily accessible, and located in the normal path of exit from the area. Additional boxes shall be provided on each floor to obtain a maximum horizontal travel distance of 200 feet to the nearest box.

(c) *Maintenance.* All systems shall be under the supervision of qualified persons. These persons shall cause tests and inspections to be made at weekly intervals, and shall have general charge of all alterations and additions to the systems under their supervision.

§ 1910.164 Fire brigades. [Reserved]

§ 1910.165 Effective dates.

(a) The provisions of this Subpart L shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.157(c).
§ 1910.158 (b) and (c).
§ 1910.159 (a), (b), and (c).
§ 1910.160(a).
§ 1910.161(a).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart L which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.165a Sources of standards.

Section	*Source*
1910.156(a)–(h)	NFPA No. 10–1970, Standard for the Installation of Portable Fire Extinguishers.
1910.156(i)–(j)	NFPA No. 13–1969, Standard for the Installation of Sprinkler Systems.
1910.156(k)–(o)	NFPA No. 14–1970, Standard for the Installation of Standpipe and Hose Systems.
1910.156(p)–(s)	NFPA No. 231–1970, Standard for Indoor General Storage.
1910.157	NFPA No. 10–1970, Standard for the Installation of Portable Fire Extinguishers.
1910.158	NFPA No. 14–1970, Standard for the Installation of Standpipe and Hose Systems.
1910.159(a)–(d)	NFPA No. 13–1969, Standard for the Installation of Sprinkler Systems.
1910.159(e)	NFPA No. 231–1970, Standard for Indoor General Storage.
1910.160	NFPA No. 17–1969, Standard for Dry Chemical Extinguishing Systems.
1910.161	NFPA No. 12–1968, Standard on Carbon Dioxide Extinguishing Systems.
1910.163	NFPA No. 72A–1967, Standard for the Installation, Maintenance, and Use of Local Protective Signalling Systems for Watchman, Fire Alarm and Supervisory Service.

§ 1910.165b Standards organizations.

Compressed Gas Association, Inc., 500 Fifth Avenue, New York, NY 10036.

National Fire Protection Association, 60 Batterymarch Street, Boston MA 02110.

American National Standards Institute, 1430 Broadway, New York NY.

Subpart M—Compressed Gas and Compressed Air Equipment

§ 1910.166 Inspection of compressed gas cylinders.

(a) *Definitions*. As used in this section:

(1) High- and low-pressure cylinders: High-pressure cylinders means those cylinders with a marked service pressure of 900 p.s.i. or greater; low-pressure cylinders are those with a marked service pressure less than 900 p.s.i.

(2) Minimum allowable wall thickness: The minimum allowable wall thickness means the minimum wall thickness required by the specification under which the cylinder was manufactured.

(3) Dents: Dents (in cylinders) means deformations caused by the cylinder coming in contact with a blunt object in such a way that the thickness of metal is not materially impaired.

(4) Cuts, gouges, or digs: Cuts, gouges, or digs (in cylinders) means deformations caused by contact with a sharp object in such a way as to cut into or upset the metal of the cylinder, decreasing the wall thickness at that point.

(5) Corrosion or pitting: Means corrosion or pitting in cylinders involving the loss of wall thickness by corrosive media. There are several kinds of pitting or corrosion to be considered.

(6) Isolated pitting: Means isolated pits of small cross-section which do not effectively weaken the cylinder wall but are indicative of possible complete penetration and leakage. Since the pitting is isolated the original wall is essentially intact.

(7) Line corrosion: Means pits which are not isolated but are connected or nearly connected to others in a narrow band or line. This condition is more serious than isolated pitting. Line corrosion frequently occurs in the area of intersection of the footring and bottom of a cylinder. This is sometimes referred to as "crevice corrosion."

(8) General corrosion: Means corrosion which covers considerable surface areas of the cylinder. It reduces the structural strength. It is often difficult to measure or estimate the depth of general corrosion because direct comparison with the original wall cannot always be made. General corrosion is often accompanied by pitting.

(9) "DOT" means the U.S. Department of Transportation.

(b) *General requirements*—(1) *Application*. (i) Each employer shall determine that compressed gas cylinders under his control are in a safe condition to the extent that this can be determined by visual and other inspection required by this subparagraph.

(ii) The requirements contained in this section are not intended to apply to cylinders manufactured under specification DOT (ICC)-3HT (49 CFR Ch. 1). Separate requirements covering service life and standards for visual inspection of these cylinders are contained in Compressed Gas Association Pamphlet C-8, "Standard for Requalification of ICC-3HT Cylinders."

(2) *Quality of inspection*. Experience in the inspection of cylinders is an important factor in determining the acceptability of a given cylinder for continued service. Users lacking this experience and having doubtful cylinders should return them to a manufacturer of the same type of cylinders for reinspection.

(c) *Inspection of low-pressure cylinders exempt from the hydrostatic test including acetylene cylinders*—(1) *Application*. This section covers cylinders of the type that are exempt from the hydrostatic retest requirements of the DOT by virtue of their exclusive use in certain noncorrosive gas service. They are not subject to internal corrosion and do not require internal shell inspection.

(2) *Preparation for inspection*. Rust, scale, caked paint, etc., shall be removed from the exterior surface so that the surface can be adequately observed. Facilities shall be provided for inverting the cylinder to facilitate inspection of the bottom. This is important because experience has shown this area to be the most susceptible to corrosion.

(3) *Exterior inspection*. Cylinders shall be checked as outlined below for corrosion, general distortion, or any other defect that might indicate a weakness which would render it unfit for service.

(i) To fix corrosion limits for all types, designs, and sizes of cylinders, and include them in this section is not practicable. Cylinders shall meet the requirements of this subdivision. Failure to meet any of the requirements of this subdivision is of itself cause for rejection of a cylinder.

(*a*) A cylinder shall be rejected when the tare weight is less than 95 percent of the original tare weight marked on the cylinder. When determining tare weight, be sure that the cylinder is empty.

(*b*) A cylinder shall be rejected when the remaining wall in an area having isolated pitting only is less than one-third of the minimum allowable wall thickness as determined under subdivision (ii), (iii), or (iv) of this subparagraph.

(*c*) A cylinder shall be rejected when line corrosion on the cylinder is 3 inches in length or over and the remaining wall is less than three-fourths of the minimum allowable wall thickness or when line corrosion is less than 3 inches in length and the remaining wall thickness is less than one-half the minimum allowable wall thickness as determined under subdivision (ii), (iii), or (iv) of this subparagraph.

(*d*) A cylinder shall be rejected when the remaining wall in an area of general corrosion is less than one-half of the minimum allowable wall thickness as determined under subdivision (ii), (iii), or (iv) of this subparagraph.

(ii) To use the criteria in subdivision (i) of this subparagraph, it is necessary to know the original wall thickness of the cylinder or the minimum allowable wall thickness. Table M-1 lists the minimum allowable wall thickness under DOT specifications (49 CFR Ch. 1) for a number of common size low-pressure cylinders.

TABLE M—1

Cylinder size O.D. x length (inches)	DOT Specification marking	Nominal water capacity (pounds)	Minimum allowable wall thickness (inches)
15 x 46	[1] 4B240	239	0.128
14 13/16 x 47	4E240	239	.140
14 15/16 x 46	4BA240	239	.086
14 11/16 x 28 5/8	4BA240	143	.086
11 29/32 x 32 11/16	4BA240	95	.078
11 29/32 x 18 11/32	4BA240	48	.078

[1] Without longitudinal seam

(iii) When the wall thickness of the cylinder at manufacture is not known, and the actual wall thickness cannot be measured, this cylinder shall be rejected when the inspection reveals that the deepest pit in a general corrosion area exceeds three sixty-fourths inch. This is arrived at by considering that in no case shall the pitting exceed one-half the minimum allowable wall thickness which is 0.064 inch. When a pit measures 0.043 inch (approximately three sixty-fourths inch) in a corrosion area, general corrosion will already have removed 0.021 inch of the original wall and the total pit depth as compared to the initial wall will be 0.064 inch.

(iv) When the original wall thickness at manufacture is known, or the actual wall thickness is measured, this thickness less one and one-half times the maximum measured pit depth shall be 0.064 inch or greater. If it is less, the cylinder shall be rejected.

(v) Dents are of concern where the metal deformation is sharp and confined, or where they are near a weld. Where metal deformation is not sharp, dents of larger magnitude can be tolerated.

(vi) Where denting occurs so that any part of the deformation includes a weld, the maximum allowable dent depth shall be one-fourth inch.

(vii) When denting occurs so that no part of the deformation includes a weld, the cylinder shall be rejected if the depth of the dent is greater than one-tenth of the mean diameter of the dent.

(viii) Cuts, gouges, or digs reduce the wall thickness of the cylinder and in addition are considered to be stress raisers. Depth limits are set in this subparagraph; however, cylinders shall be rejected at one-half of the limit set whenever the length of the defect is 3 inches or more.

(*a*) When the original wall thickness at manufacture is not known, and the actual wall thickness cannot be measured a cylinder shall be rejected if the cut, gouge, or dig exceeds one-half of the minimum allowable wall thickness as determined under subdivision (ii), (iii), or (iv) of this subparagraph.

(*b*) When the original wall thickness at manufacture is known, or the actual wall thickness is measured, a cylinder shall be rejected if the original wall thickness minus the depth of the defect is less than one-half of the minimum allowable wall thickness as determined under subdivision (ii), (iii), or (iv) of this subparagraph.

(ix) Leaks can originate from a number of sources, such as defects in a welded or brazed seam, defects at the threaded opening, or from sharp dents, digs, gouges, or pits.

(*a*) To check for leaks, the cylinder shall be charged and carefully examined. All seams and pressure openings shall be coated with a soap or other suitable solution to detect the escape of gas. Any leakage is cause for rejection.

(*b*) Safety relief devices as defined in § 1910.167(a)(1) shall be tested for leaks before a charged cylinder is shipped from the cylinder filling plant.

(x) After fire damage, cylinders shall be carefully inspected for evidence of exposure to fire.

(*a*) Common evidences of exposure to fire are:

(*1*) Charring or burning of the paint or other protective coat,

(*2*) Burning or sintering of the metal,

(*3*) Distortion of the cylinder,

(*4*) Melted out fuse plugs,

(*5*) Burning or melting of valve.

(*b*) The evaluation of fire damage by DOT Regulations state that, "A cylinder which has been subjected to the action of fire must not again be placed in service until it has been properly reconditioned", in accordance with 49 CFR 173.34(f) The general intent of this requirement is to remove from service cylinders which have been subject to the action of fire which has changed the metallurgical structure or the strength properties of the steel, or in the case of acetylene cylinders caused breakdown of porous filler. This is normally determined by visual examination as covered above with particular emphasis to the condition of the protective coating. If the protective coating has been burnt off or if the cylinder body is burnt, warped, or distorted, it is assumed that the cylinder has been overheated and 49 CFR 173.34(f) shall be complied with. If, however, the protective coating is only dirtied from smoke or other debris, and is found by examination to be intact underneath, the cylinder shall not be considered affected within the scope of this requirement.

(xi) Cylinders are manufactured with a reasonably symmetrical shape. Cylinders which have definite visible bulges shall be removed from service and evaluated. Cylinders shall be rejected when a variation of 1 percent or more is found in the measured circumferences or in peripheral distances measured from the valve spud to the center seam (or equivalent fixed point).

(xii) Cylinder necks shall be examined for serious cracks, folds, and flaws. Neck cracks are normally detected by testing the neck during charging operations with a soap solution.

(xiii) Cylinder neck threads shall be examined whenever the valve is removed from the cylinder. Cylinders shall be rejected if the required number of effective threads are materially reduced, or if a gas tight seal cannot be obtained by reasonable valving methods. Gages shall be used to measure the number of effective threads.

(xiv) If the valve is noticeably tilted the cylinder shall be rejected.

(xv) The footring and headring of cylinders may become so distorted through service abuse that they no longer perform their functions:

(*a*) To cause the cylinder to remain stable and upright,

(*b*) To protect the valve. Rings shall be examined for distortion; for looseness, and for failure of welds. Appearances may often warrant rejection of the cylinder.

(d) *Low-pressure cylinders subject to hydrostatic testing.*—(1) *Application.* Cylinders covered in this section are low-pressure cylinders other than those covered in paragraph (c) of this section. They differ essentially from such cylinders in that they require a periodic hydrostatic retest which includes an internal and external examination. Defect limits for the external examination are prescribed in paragraph (c) of this section, with exceptions for aluminum cylinders shown in subparagraph (4) of this paragraph.

(2) *Preparation for inspection.* Flammable gas cylinders shall be purged before being examined with a light. Lamps used for flammable gas cylinder inspection shall be explosion proof.

(3) *Internal inspection.* Cylinders shall be inspected internally at least every time the cylinder is periodically retested. The examination shall be made with a light of sufficient intensity to clearly illuminate the interior walls.

(4) *External inspection of aluminum cylinders.* The inspection requirements of paragraph (c) of this section shall be met, except as follows:

(i) Aluminum cylinders shall be rejected when impairment to the surface (corrosion or mechanical defect) exceeds a depth where the remaining wall is less than three-fourths of the minimum allowable wall thickness required by the specification under which the cylinder was manufactured.

(ii) Aluminum cylinders subjected to the action of fire shall be removed from service.

(e) *High-pressure cylinders*—(1) *Application.* High-pressure cylinders are those with a marked service pressure of 900 p.s.i. or higher. They are seamless; no welding is permitted. The great bulk of such cylinders are of the 3A or 3AA types under DOT Specifications (49 CFR Ch. I).

(2) *Preparation for inspection.* (i) Cylinders shall be cleaned for inspection so that the inside and outside surfaces and all conditions can be observed. This shall include removal of scale and caked paint from the exterior and the thorough removal of internal scale. Cylinders with interior coating shall be examined for defects in the coating. If the coating is defective, it shall be removed.

(ii) A good inspection light of sufficient intensity to clearly illuminate the interior wall is mandatory for internal inspection. Flammable gas cylinders shall be purged before being examined with a light. Lamps for flammable gas cylinder inspection shall be explosion proof.

(3) *Exterior inspection.* (i) To fix corrosion limits for all types, designs, and

sizes of cylinders, and include them in this section, is not practicable. Considerable judgment is required in evaluating cylinders fit for service. Experience is a major factor, aside from strength considerations for high pressure cylinders.

(ii) When the original wall thickness of the cylinder is not known, and the actual wall thickness cannot be measured, the cylinder is rejected if corrosion exceeds one thirty-second inch in depth. This is arrived at by subtracting from the minimum allowable wall at manufacture (0.221 inch), the limiting wall in service (0.195 inch), to give the maximum allowable corrosion limit of 0.026 inch, say one thirty-second inch.

(iii) When the wall thickness is known, or the actual wall thickness is measured, the difference between this known wall and the limiting value establishes the maximum corrosion figure. The normal hot forged cylinder of this size will have a measured wall of about 0.250 inch. Comparison of this with the limiting wall thickness shows that defects up to about one-sixteenth inch are allowable provided, of course, that the actual wall is measured or is known.

(iv) Cylinders with general corrosion are evaluated by subjecting them to a hydrostatic test. Thus, a cylinder with an elastic expansion of 227 cc. or greater shall be rejected. If areas of pronounced pitting are included within the general corrosion, the depth of such pitting should also be measured (with the high spots of the actual surface as a reference plane) and the criteria established in the first example apply. Thus, the maximum corrosion limit would be one thirty-second inch when the wall was not known.

(v) Any defect of appreciable depth having a sharp bottom is a stress raiser and even though a cylinder may be acceptable from a stress standpoint, it is common practice to remove such defects. After any such repair operation, verification of the cylinder strength and structure shall be made by a hydrostatic test or other suitable means.

(vi) Dents can be tolerated when the cylinder wall is not deformed excessively or abruptly. Generally speaking, dents are accepted up to a depth of about one-sixteenth inch when the major diameter of the dent is equal to or greater than 32 times the depth of the dent. Sharper dents than this are considered too abrupt and shall require rejection of the cylinder. On small diameter cylinders these general rules may have to be adjusted. Considerations of appearance play a major factor in the evaluation of dents.

(vii) Cylinders with arc or torch burns shall be removed from service. Defects of this nature may be recognized by one of the following conditions:

(*a*) Removal of metal by scarfing or cratering.

(*b*) A sintering or burning of the base metal.

(*c*) A hardened heat affected zone. A simple method for verifying the presence of small arc burns is to file the suspected area. The hardened zone will resist filing as compared to the softer base metal.

(viii) Cylinders are normally produced with a symmetrical shape. Cylinders with distinct visual bulges shall be removed from service until the nature of the defect is determined. Some cylinders may have small discontinuities related to the manufacturing process—mushroomed bottoms, offset shoulders, etc. These usually can be identified and are not normally cause for concern.

(ix) Cylinders shall be carefully inspected for evidences of exposure to fire. See paragraph (c)(3)(x) of this section.

(x) Cylinder necks shall be examined for serious cracks, folds, and flaws. See paragraphs (c)(3) (xii) and (xiii) of this section.

(f) *Internal inspection.* (1) Cylinders shall be inspected internally at least every time the cylinder is periodically retested. This examination shall be made with a light of sufficient intensity to clearly illuminate the interior walls.

(2) A hammer test consists of tapping a cylinder a light blow with a suitably sized hammer. A cylinder, emptied of liquid content, with a clean internal surface, standing free, will have a clear ring. Cylinders with internal corrosion will give a duller ring dependent upon the amount of corrosion and accumulation of foreign material. Such cylinders shall be investigated. The hammer test is very sensitive and is an easy, quick, and convenient test that can be made without removing the valve before each charging. It is an invaluable indicator of internal corrosion.

§ 1910.167 Safety relief devices for compressed gas cylinders.

(a) *Definitions.* As used in this section:

(1) *Safety relief device.* A "safety relief device" is a device intended to prevent rupture of a cylinder under certain conditions of exposures. (The term as used herein shall include the approach channel, the operating parts, and the discharge channel.)

(2) *Approach channel.* An "approach channel" is the passage or passages through which gas must pass from the cylinder to reach the operating parts of the safety relief device.

(3) *Discharge channel.* A "discharge channel" is the passage or passages beyond the operating parts through which gas must pass to reach the atmosphere exclusive of any piping attached to the outlet of the device.

(4) *Safety relief device channel.* A "safety relief device channel" is the channel through which gas released by operation of the device must pass from the cylinder to the atmosphere exclusive of any piping attached to the inlet or outlet of the device.

(5) *Operating part.* The "operating part" of a safety relief device is the part of a safety relief device that normally closes the safety discharge channel but when moved from this position as a result of the action of heat or pressure, or a combination of the two, permits escape of gas from the cylinder.

(6) *Frangible disc.* A "frangible disc" is an operating part in the form of a disc, usually of metal and which is so held as to close the safety relief device channel under normal conditions. The disc is intended to burst at a predetermined pressure to permit the escape of gas.

(7) *Pressure opening.* A "pressure opening" is the orifice against which the frangible disc functions.

(8) *Rated bursting pressure.* A "rated bursting pressure" of a frangible disc is the maximum pressure for which the disc is designed to burst when in contact with the pressure opening for which it was designed when tested.

(9) *Fusible plug.* A "fusible plug" is an operating part in the form of a plug of suitable low melting material, usually a metal alloy, which closes the safety relief device channel under normal conditions and is intended to yield or melt at a predetermined temperature to permit the escape of gas.

(10) *Yield temperature.* The "yield temperature" of a fusible plug is the temperature at which the fusible metal or alloy will yield when tested.

(11) *Reinforced fusible plug.* A "reinforced fusible plug" is a fusible plug consisting of a core of suitable material having a comparatively high yield temperature surrounded by a low-melting point fusible metal of the required yield temperature.

(12) *Combination frangible disc-fusible plug.* A "combination frangible disc-fusible plug" is a frangible disc in combination with a low melting point fusible metal, intended to prevent its bursting at its predetermined bursting pressure unless the temperature also is high enough to cause yielding or melting of the fusible metal.

(13) *Safety relief valve.* A "safety relief valve" is a safety relief device containing an operating part that is held normally in a position closing the safety relief device channel by spring force and is intended to open and to close at predetermined pressures.

(14) *Combination safety relief valve and fusible plug.* A "combination safety relief valve and fusible plug" is a safety relief device utilizing a safety relief valve in combination with a fusible plug. This combination device may be an integral unit or separate units and is intended to open and to close at predetermined pressures or to open at a predetermined temperature.

(15) *Set pressure.* The "set pressure" of a safety relief valve is the pressure marked on the valve and at which it is set to start-to-discharge.

(16) *Start-to-discharge pressure.* The "start-to-discharge pressure" of a safety relief valve is the pressure at which the first bubble appears through a water seal of not over 4 inches on the outlet of the safety relief valve.

(17) *Flow capacity.* The "flow capacity" of a safety relief device is the capacity in cubic feet per minute of free air discharged at the required flow rating pressure.

(18) *Flow rating pressure.* The "flow rating pressure" is the pressure at which a safety relief device is rated for capacity.

(19) *Nonliquefied compressed gas.* A "nonliquefied compressed gas" is a gas, other than a gas in solution which under the charging pressure, is entirely gaseous at a temperature of 70° F.

(20) *Liquefied compressed gas.* A "liquefied compressed gas" is a gas which, under the charging pressure, is partially liquid at a temperature of 70° F. A flammable compressed gas which is normally nonliquefied at 70° F. but which is partially liquid under the charging pressure and temperature, shall follow the requirements for liquefied compressed gases.

(21) *Compressed gas in solution.* A "compressed gas in solution" (Acetylene) is a nonliquefied gas which is dissolved in a solvent.

(22) *Pressurized liquid compressed gas.* A "pressurized liquid compressed gas" is a compressed gas other than a compressed gas in solution, which cannot be liquefied at a temperature of 70° F., and which is maintained in the liquid state at a pressure not less than 40 p.s.i.a. by maintaining the gas at a temperature less than 70° F.

(23) *Test pressure of the cylinder.* The "test pressure of the cylinder" is the minimum pressure at which a cylinder must be tested as prescribed in DOT specifications for compressed gas cylinders 41 CFR Ch. I.

(24) *Free air or free gas.* "Free air" or "free gas" is air or gas measured at a pressure of 14.7 pounds per square inch absolute and a temperature of 60° F.

(25) *DOT regulations.* As used in this section "DOT regulations" refers to the U.S. Department of Transportation Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express and Baggage Services and by Motor Vehicle (Highway) and Water, including Specifications for Shipping Containers, Code of Federal Regulations, Title 49, Parts 171 to 178.

(b) *General requirements*—(1) *Application.* Compressed gas cylinder, portable tanks, and cargo tanks shall have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda and S-1.2-1963.

(2) *Types of safety relief devices.* Types of safety relief devices as covered by this section are designated as follows:

(i) Type CG-1: Frangible disc.

(ii) Type CG-2: Fusible plug or reinforced fusible plug utilizing a fusible alloy with yield temperature not over 170° F., nor less than 157° F. (165° F. nominal).

(iii) Type CG-3: Fusible plug or reinforced fusible plug utilizing a fusible alloy with yield temperature not over 220° F., nor less than 208° F. (212° F. nominal).

(iv) Type CG-4: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 170° F., nor less than 157° F. (165° F. nominal).

(v) Type CG-5: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 220° F., nor less than 208° F. (212° F. nominal).

(vi) Type CG-7: Safety relief valve.

(vii) Type CG-8: Combination safety relief valve and fusible plug.

(3) *Specifications and tests.* All safety relief devices covered by this section shall meet the design, construction, marking and test specification of the "Compressed Gas Association Safety Relief Device Standards Part 1—Cylinders for Compressed Gases: S1.1-1963."

(4) *Specific requirements for safety relief devices.* (i) Compressed gas cylinders, which under the Regulations of the Department of Transportation must be equipped with safety relief devices, shall be considered acceptable when equipped with devices of proper construction, location, and discharge capacity under the conditions prescribed in Table 1 of the Compressed Gas Associations Standard S-1.1-1963.

(ii) Only replacement parts or assemblies provided by the manufacturer shall be used unless the advisability of interchange is proved by adequate tests.

(iii) When a frangible disc is used with a compressed gas cylinder, the rated bursting pressure of the disc shall not exceed the minimum required test pressure of the cylinder with which the device is used, except for DOT-3E cylinders (49 CFR Ch. I) the rated bursting pressure of the device shall not exceed 4,500 pounds per square inch gage (p.s.i.g.).

(iv) When a safety relief valve is used on a compressed gas cylinder, the flow rating pressure shall not exceed the minimum required test pressure of the cylinder on which the safety relief valve is installed and the reseating pressure shall not be less than the pressure in a normally charged cylinder at 130° F.

(v) When fittings and piping are used on either the upstream or downstream side or both of a safety relief device or devices, the passages shall be so designed that the flow capacity of the safety relief device will not be reduced below the capacity required for the container on which the safety relief device assembly is installed, nor to the extent that the operation of the device could be impaired. Fittings, piping, and method of attachment shall be designed to withstand normal handling and the pressures developed when the device or devices function.

(vi) No shutoff valve shall be installed between the safety relief devices and the cylinder.

(5) *Maintenance requirements for safety relief devices.* (i) As a precaution to keep cylinder safety relief devices in reliable operating condition, care shall be taken in the handling or storing of compressed gas cylinders to avoid damage. Care shall also be exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device. Only qualified personnel shall be allowed to service safety relief devices.

(ii) Each time a compressed gas cylinder is received at a point for refilling, all safety relief devices shall be examined externally for corrosion, damage, plugging of external safety relief device channels, and mechanical defects such as leakage or extrusion of fusible metal. If there is any doubt regarding the suitability of the safety relief device for service the cylinder shall not be filled until it is equipped with a suitable device.

§ 1910.168 Safety relief devices for cargo and portable tanks storing compressed gases.

(a) *Definitions applicable to this section*—(1) *Cargo tank.* A "cargo tank" means any container designed to be permanently attached to any motor vehicle or other highway vehicle and in which is to be transported any compressed gas. The term "cargo tank" shall not be construed to include any tank used solely for the purpose of supplying fuel for the propulsion of the vehicle or containers fabricated under specifications for cylinders.

(2) *Portable tank.* A "portable tank" means any container designed primarily to be temporarily attached to a motor vehicle, other vehicle, railroad car other than tank car, or marine vessel, and equipped with skids, mountings, or accessories to facilitate handling of the container by mechanical means, in which is to be transported any compressed gas. The term "portable tank" shall not be construed to include any cargo tank, any tank car tank, or any tank of the DOT-106A and DOT-110A-W type.

(3) *Safety relief device.* A "safety relief device" means a device intended to prevent rupture of a container under certain conditions of exposure.

(4) *Safety relief valve.* A "safety relief valve" means a safety relief device containing an operating part that is held normally in a position closing the safety relief device channel by spring force and is intended to open and to close at predetermined pressures.

(5) *Set pressure.* The "set pressure" of a safety relief valve is the pressure marked on the valve and at which the valve is set to start-to-discharge.

(6) *Start-to-discharge pressure.* The "start-to-discharge pressure" of a safety relief valve is the pressure at which the first bubble appears through a water seal of not over 4 inches on the outlet of the valve.

NOTE: When the nature of the service requires the use of a metal-to-metal seat safety relief valve, with or without secondary sealing means, the start-to-discharge pressure may be considered the pressure at which an audible discharge occurs.

(7) *Resealing pressure.* The "resealing pressure" of a safety relief valve is the pressure at which leakage ceases through a water seal of not over 4 inches on the outlet of the valve.

(8) *Flow capacity.* The "flow capacity" of a safety relief device is the capacity in cubic feet per minute of free air discharged at the required flow rating pressure.

(9) *Flow rating pressure.* The "flow rating pressure" means the pressure at which a safety relief device is rated for capacity.

(10) *Free air or free gas.* "Free air" or "free gas" means air or gas measured at a pressure of 14.7 pounds per square inch absolute and a temperature of 60° F.

(11) *Frangible disc.* A "frangible disc" means a safety relief device in the form of a disc, usually of metal, which is so held as to close the safety relief device channel under normal conditions. The disc is intended to burst at a predetermined pressure to permit the escape of gas.

(12) *Fusible plug.* A "fusible plug" means a safety relief device in the form of a plug of suitable low-melting material, usually a metal alloy, which closes the safety relief device channel under normal conditions and is intended to yield or melt at a predetermined temperature to permit the escape of gas.

(13) *DOT design pressure.* The "DOT design pressure" is identical to the term "maximum allowable working pressure" as used in the "Code" and is the maximum gage pressure at the top of the tank in its operating position. To determine the minimum permissible thickness of physical characteristics of the different parts of the vessel, the static head of the lading shall be added to the DOT design pressure to determine the thickness of any specific part of the vessel. If vacuum insulation is used, the liquid container shall be designed for a pressure of 15 p.s.i. more than DOT design pressure, plus static head of the lading.

EXCEPTION: For containers constructed in accordance with paragraph U-68 or U-69 of section VIII of the ASME Boiler and Pressure Vessel Code, 1949 Edition, the maximum allowable working pressure for the purpose of these standards is considered to be 125 percent of the design pressure as provided in 49 CFR 173.315 of DOT Regulations.

(14) *Code.* "Code" is defined as paragraph U-68, U-69, U-200 or U-201 of section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1949 Edition; or section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1950, 1952, 1956, 1959, and 1962 Editions; or The Code for Unfired Pressure Vessels for Petroleum Liquids and Gases of the American Petroleum Institute and the American Society of Mechanical Engineers (API-ASME), 1951 Edition.

(15) *DOT regulations.* The "DOT regulations" refers to Department of Transportation Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express and Baggage Services and by Motor Vehicle (Highway) and Water, including Specifications for Shipping Containers," Code of Federal Regulations, Title 49, Parts 171 to 178.

(b) *General requirements*—(1) *Application.* See § 1910.167(b)(1).

(2) *Specifications and tests.* All safety relief devices covered by this section shall meet the design, construction, marking, and test specifications of the "Compressed Gas Associations Safety Relief Device Standards Part 2—Cargo and Portable Tanks for Compressed Gases: S-1.2-1963."

(3) *Specific requirements for safety relief devices.* (i) Each container shall be provided with one or more safety relief devices which, unless otherwise specified, shall be safety relief valves of the spring-loaded type.

(ii) Safety relief valves shall be set to start-to-discharge at a pressure not in excess of 110 percent of the DOT design pressure of the container nor less than the DOT design pressure of the container except as follows:

(*a*) If an overdesigned container is used, the set pressure of the safety relief valve may be between the minimum required DOT design pressure for the lading and 110 percent of the DOT design pressure of the container used.

(*b*) For sulfur dioxide containers, a minimum set pressure of 120 and 110 p.s.i.g. is permitted for the 150 and 125 p.s.i.g. DOT design pressure containers, respectively.

(*c*) For carbon dioxide (refrigerated), nitrous oxide (refrigerated), and pressurized liquid argon, nitrogen and oxygen, there shall be no minimum set pressure.

(*d*) For butadiene, inhibited, and liquefied petroleum gas containers, a minimum set pressure of 90 percent of the minimum DOT design pressure permitted for these ladings may be used.

(*e*) For containers constructed in accord with paragraph U-68 or U-69 of the Code 1949 Edition, the set pressure marked on the safety relief valve may be 125 percent of the original DOT design pressure of the container.

(iii) Only replacement parts or assemblies provided by the manufacturer of the device shall be used unless the suitability of interchange is proved by adequate tests.

(iv) Safety relief valves shall have direct communication with the vapor space of the container.

(v) Any portion of liquid piping or hose which at any time may be closed at each end must be provided with a safety relief device to prevent excessive pressure.

(vi) The additional restrictions of this subdivision apply to safety relief devices on containers for carbon dioxide or nitrous oxide which are shipped in refrigerated and insulated containers. The maximum operating pressure in the container may be regulated by the use of one or more pressure controlling devices, which devices shall not be in lieu of the safety relief valve required in subdivision (i) of this subparagraph.

(vii) All safety relief devices shall be so installed and located that the cooling effect of the contents will not prevent the effective operation of the device.

(viii) In addition to the safety relief valves required by subdivision (i) of this subparagraph each container for carbon dioxide may be equipped with one or more frangible disc safety relief devices of suitable design set to function at a pressure not exceeding two times the DOT design pressure of the container.

(ix) Subject to conditions of 49 CFR 173.315(a)(1) (DOT Regulations) for methyl chloride and sulfur dioxide optional portable tanks of 225 p.s.i.g. minimum DOT design pressure, one or more fusible plugs approved by the Bureau of Explosives, 63 Vesey Street, New York, NY 10007, may be used in lieu of safety relief valves of the spring-loaded type. If the container is over 30 inches long a safety relief device having the total required flow capacity must be at both ends.

(x) When storage containers for liquefied petroleum gas are permitted to be shipped in accordance with 49 CFR 173.315(j) (DOT Regulations), they must be equipped with safety relief devices in compliance with the requirements for safety relief devices on above-ground containers as specified in the National Fire Protection Association Pamphlet No. 58-1969 "Standard for the Storage and Handling of Liquefied Petroleum Gases."

(xi) When containers are filled by pumping equipment which has a discharge capacity in excess of the capacity of the container safety relief devices, and which is capable of producing pressures in excess of DOT design pressure of the container, precautions should be taken to prevent the development of pressures in the container in excess of 120 percent of its DOT design pressure. This may be done by providing additional capacity of the safety relief valves on the container, by providing a bypass on the pump discharge, or by any other suitable method.

(xii) This additional requirement applies to safety relief devices on containers for liquefied hydrogen and pressurized liquid argon, nitrogen, and oxygen. The liquid container shall be protected by one or more safety relief valves and one or more frangible discs.

(xiii) Safety relief devices shall be arranged to discharge unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container. Safety relief devices shall be arranged to discharge upward except this is not required for carbon dioxide, nitrous oxide and pressurized liquid argon, nitrogen, and oxygen.

(xiv) No shutoff valves shall be installed between the safety relief devices and the container except, in cases where two or more safety relief devices are installed on the same container, a shutoff valve may be used where the arrangement of the shutoff valve or valves is such as always to insure full required capacity flow through at least one safety relief device.

(4) *Maintenance requirements for safety relief devices.* (i) Care shall be exercised to avoid damage to safety relief devices. Care shall also be exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device.

(ii) Only qualified personnel shall be allowed to service safety relief devices. Any servicing or repairs which require resetting of safety relief valves shall be done only by or after consultation with the valve manufacturer.

(iii) Safety relief devices periodically shall be examined externally for corrosion, damage, plugging or external safety relief device channels, and mechanical defects such as leakage or extrusion of fusible metal. Valves equipped with secondary resilient seals shall have the seals inspected periodically. If there is any doubt regarding the suitability of the safety relief device for service the container shall not be filled until it is equipped with a suitable safety relief device.

§ 1910.169 Air receivers.

(a) *General requirements*—(1) *Application*. This section applies to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operations such as cleaning, drilling, hoisting, and chipping. On the other hand, however, this section does not deal with the special problems created by using compressed air to convey materials nor the problems created when men work in compressed air as in tunnels and caissons. This section is not intended to apply to compressed air machinery and equipment used on transportation vehicles such as steam railroad cars, electric railway cars, and automotive equipment.

(2) *New and existing equipment* (i) All new air receivers installed after the effective date of these regulations shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code Section VIII.

(ii) All safety valves used shall be constructed, installed, and maintained in accordance with the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII Edition 1968.

(b) *Installation and equipment requirements*—(1) *Installation*. Air receivers shall be so installed that all drains, handholes, and manholes therein are easily accessible. Air receivers should be supported with sufficient clearance to permit a complete external inspection and to avoid corrosion of external surfaces. Under no circumstances shall an air receiver be buried underground or located in an inaccessible place. The receiver should be located as close to the compressor or aftercooler as is possible in order to keep the discharge pipe short.

(2) *Drains and traps*. A drain pipe and valve shall be installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water. Adequate automatic traps may be installed in addition to drain valves. The drain valve on the air receiver shall be opened and the receiver completely drained frequently and at such intervals as to prevent the accumulation of excessive amounts of liquid in the receiver.

(3) *Gages and valves*. (i) Every air receiver shall be equipped with an indicating pressure gage (so located as to be readily visible) and with one or more spring-loaded safety valves. The total relieving capacity of such safety valves shall be such as to prevent pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than 10 percent.

(ii) No valve of any type shall be placed between the air receiver and its safety valve or valves.

(iii) Safety appliances, such as safety valves, indicating devices and controlling devices, shall be constructed, located, and installed so that they cannot be readily rendered inoperative by any means, including the elements.

(iv) All safety valves shall be tested frequently and at regular intervals to determine whether they are in good operating condition.

§ 1910.170 Sources of standards.

Sec.	*Source*
1910.166	41 CFR 50–204.65 referencing CGA C–6–1968, Standards for Visual Inspection of Compressed Gas Cylinders.
1910.167	41 CFR 50–204.71 and CGA Pamphlets S–1.1–1963 and 1965 addenda and S–1.2–1963 and 1965 addenda and S–1.2–1963, Safety Relief Device Standards.
1910.169	ANSI B–19, 1938 Safety Code for Compressed Air Machinery.

§ 1910.171 Standards organizations.

Specific standards of the following organizations have been referenced in this part. Copies of the referenced materials may be obtained from the issuing organizations.

Compressed Gas Association, Inc., 500 Fifth Avenue, New York, NY 10036.

American Society of Mechanical Engineers, Inc., United Engineering Center, 345 East 47th Street, New York, NY 10017.

National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.

American National Standards Institute, 1430 Broadway, New York, NY 10018.

Subpart N—Materials Handling and Storage

§ 1910.176 Handling materials—general.

(a) *Use of mechanical equipment*. Where mechanical handling equipment is used, sufficient safe clearances shall be allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made. Aisles and passageways shall be kept clear and in good repair, with no obstruction across or in aisles that could create a hazard. Permanent aisles and passageways shall be appropriately marked.

(b) *Secure storage*. Storage of material shall not create a hazard. Bags, containers, bundles, etc., stored in tiers shall be stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse.

(c) *Housekeeping*. Storage areas shall be kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage. Vegetation control will be exercised when necessary.

(d) *Drainage*. Proper drainage shall be provided.

(e) *Clearance limits*. Clearance signs to warn of clearance limits shall be provided.

(f) *Rolling railroad cars*. Derail and/or bumper blocks shall be provided on spur railroad tracks where a rolling car could contact other cars being worked, enter a building, work or traffic area.

(g) *Guarding*. Covers and/or guardrails shall be provided to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.

§ 1910.177 Indoor general storage.

(a) *Definitions applicable to this section*. (1) "Available height for storage" means the maximum height at which commodities can be stored above the floor and still maintain adequate clearance from structural members and the required clearance below sprinklers.

(2) "Ordinary combustibles" designates commodities packaging or storage aids which have heats of combustion (British thermal units per pound) similar to wood, cloth, or paper and which produce fires that may normally be extinguished by the quenching and cooling effect of water. This type of fire is defined as a Class A fire in the Standard for the Installation of Portable Fire Extinguishers, NFPA No. 10–1970.

(3) "Exposure" means the exterior presence of combustibles which, if ignited, could cause damage to the storage building or its contents.

(4) A "firewall" is a wall designed to prevent the spread of fire, having a fire resistance rating of not less than 4 hours and having sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of wall.

(5) "Horizontal channel" means any uninterrupted space in excess of 5 feet in length between horizontal layers of stored commodities. Such channels may be formed by pallets, shelving, racks, or other storage arrangements.

(6) "Noncombustible" designates commodities, packaging, or storage aids which will not ignite, burn or liberate flammable gases when heated to a temperature of 1,380° Fahrenheit for 5 minutes.

(7) "Packaging" designates any commodity wrapping, cushioning, or container.

(8) "Storage aids" means commodity storage devices such as shelves, pallets, dunnage, decks, platforms, trays, bins, separators, and skids.

(9) A "warehouse" is any building or area within a building used principally for the storage of commodities.

(10) "Type I storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored over 15 feet but not more than 21 feet high in solid piles or over 12 feet but not more than 21 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(11) "Type II storage" is that in which combustible commodities or noncombustible commodities involving combustible packaging or storage aids are stored not over 15 feet high in solid piles or not over 12 feet high in piles that contain horizontal channels. Minor quantities of commodities of hazard greater than ordinary combustibles may be included without affecting this general classification.

(12) "Type III storage" is that in which the stored commodities, packaging and storage aids are noncombustible

or contain only a small concentration of combustibles which are incapable of producing a fire that would cause appreciable damage to the commodities stored or to noncombustible wall, floor or roof construction. Ordinary combustible commodities in completely sealed noncombustible containers may qualify in this classification. General commodity storage that is subject to frequent changing and storage of combustible packaging and storage aids is excluded from this category.

(13) "Approved" means listed or approved by at least one of the following nationally recognized testing laboratories: Underwriters Laboratories, Inc.; Factory Mutual Engineering Corp.

(b) *General requirements*—(1) *Application.* This standard applies to storage, 21 feet or less in height, of commodities which with their packaging and storage aids would classify as ordinary combustibles. This standard also applies to storage of commodities which with their packaging and storage aids would classify as noncombustibles regardless of storage height. This standard does not cover unpackaged bulk storage such as grain, coal, or similar commodities. The provisions contained in this standard apply to new buildings. Certain specific commodities introduce hazards different from those contemplated by this standard. Examples are rubber tires, roll paper, and wax-coated cartons.

(2) *Exemptions.* (i) Ordinary combustibles piled higher than 21 feet introduce serious fire protection problems which are not within the scope of this standard.

(ii) The provisions of this standard do not apply to Refrigerated Warehouses.

(3) *Portable fire extinguishers.* Portable fire extinguishers shall be provided at convenient conspicuously accessible locations. In locations where small hose is provided, portable fire extinguishers for Class A fires may be omitted.

(4) *Alarm service.* Storage facilities shall be provided with alarm service. (It may be in the form of central station supervision of automatic fire detection or sprinkler waterflow alarms or watchman making recorded rounds during unattended periods.)

(c) *Piling procedures and precautions.* (1) All commodities shall be stored, handled and piled with due regard to their fire characteristics.

(2) Significant quantities of commodities with fire hazards greater than ordinary combustible commodities as contemplated by this standard, shall be separated from the main bulk of storage by firewalls.

(3) Any commodities which may be hazardous in combination with each other shall be stored so that they cannot come in contact with each other.

(4) Safe floor loads shall not be exceeded.

(d) *Fire protection requirements*—(1) *Sprinkler systems.* All warehouses having combustible roof or floor construction and all warehouses containing Type I or Type II storage shall be protected with a system of automatic sprinklers designed and installed in accordance with the Standard for the Installation of Sprinkler Systems, NFPA No. 13–1969.

(2) *Hose system water supply.* (i) Water supplies for hose streams shall be provided to supplement that required for automatic sprinklers.

(ii) Where private underground supply mains are necessary, they shall be installed in accordance with Standard for Outside Protection, NFPA No. 24–1970.

(3) *Hose systems.* (i) Small hose (1½ inch) where required by this standard shall be installed in accordance with Standard for the Installation of Sprinkler Systems NFPA No. 13–1969 and Standard for the Installation of Standpipe and Hose Systems, NFPA No. 14–1970.

(ii) In Type I and Type II storage, sufficient small hose (1½ inch) shall be provided so that one hose stream can reach any portion of the storage area. In buildings three stories or less high, small hose (1½ inch) may be supplied from the sprinkler system in accordance with limitations outlined in Standard for the Installation of Sprinkler Systems, NFPA No. 13–1969.

(iii) Standpipe and hose systems conforming to the requirements of Standard for the Installation of Standpipe and Hose Systems, NFPA No. 14–1970, shall be provided for buildings over three stories in height or having a floor level 75 feet or more above grade. Standpipes shall be fully equipped for fire department operations including fire department connections.

(iv) Large hose (2½ inch) and related equipment shall be provided unless the public fire department will provide such equipment promptly.

(e) *Mechanical handling equipment.* (1) Power-operated industrial trucks shall be of type designated in Standard for the Use, Maintenance and Operation of Powered Industrial Trucks, NFPA No. 505–1969, Part A, in accordance with the hazards of the location in which they are used.

(2) Maintenance and operation of electric, liquid, and gaseous fueled industrial trucks shall be in accordance with Standard for the Use, Maintenance and Operation of Powered Industrial Trucks, NFPA No. 505–1969, Parts B and C.

(f) *Building service equipment.* (1) Heating, lighting, and service equipment shall be of approved types, installed, maintained and operated in accordance with good practice.

(2) Steam lines and other heating equipment and machinery shall be installed or protected so that the stored commodities cannot come in contact with the heating elements.

(3) Electrical equipment shall be installed in accordance with the provisions of the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968).

(4) Refrigeration systems, if used, shall conform to the recommendations of Safety Code for Mechanical Refrigeration, American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRE) 15–63, ANSI B9.1–1964.

(5) Stored commodities shall not be located under liquid fuel heating equipment.

(g) *Smoking.* Smoking shall be strictly prohibited, except in locations prominently designated as smoking areas, and "No Smoking" signs shall be posted in prohibited areas.

§ 1910.178 Powered industrial trucks.

(a) *General requirements.* (1) The requirements of this section apply to fire protection for fork trucks, tractors, platform lift trucks, motorized hand trucks and other specialized industrial trucks powered by electric motors or internal combustion engines. These fire protection requirements do not apply to compressed air or nonflammable compressed gas-operated industrial trucks, nor to farm vehicles, nor automotive vehicles for highway use.

(2) All new powered industrial trucks acquired and used by an employer after the effective date specified in paragraph (b) of § 1910.182 shall meet the design and construction requirements for powered industrial trucks established in the "American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1–1969", except for vehicles intended primarily for earth moving or over-the-road hauling.

(3) Approved trucks shall bear a label or some other identifying mark indicating approval by the testing laboratory. See subparagraph (7) of this paragraph and paragraph 405 of "American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1–1969", which is incorporated by reference in subparagraph (2) of this paragraph and which provides that if the powered industrial truck is accepted by a nationally recognized testing laboratory it should be so marked.

(4) Modifications and additions which affect capacity and safe operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

(5) If the truck is equipped with front-end attachments other than factory installed attachments, the user shall request that the truck be marked to identify the attachments and show the approximate weight of the truck and attachment combinaticn at maximum elevation with load laterally centered.

(6) The user shall see that all nameplates and markings are in place and are maintained in a legible condition.

(7) Definition: As used in this section, "approved" means labeled by a nationally recognized testing laboratory; i.e., a laboratory qualified and equipped to conduct the necessary tests required under "American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1–1969", in accordance with the requirements of section 405 thereof.

(b) *Designations.* For the purpose of this standard there are eleven different designations of industrial trucks or tractors as follows: D, DS, DY, E, ES, EE, EX, G, GS, LP, and LPS.

(1) The D designated units are units similar to the G units except that they are diesel engine powered instead of gasoline engine powered.

(2) The DS designated units are diesel powered units that are provided with ad-

ditional safeguards to the exhaust, fuel and electrical systems. They may be used in some locations where a D unit may not be considered suitable.

(3) The DY designated units are diesel powered units that have all the safeguards of the DS units and in addition do not have any electrical equipment including the ignition and are equipped with temperature limitation features.

(4) The E designated units are electrically powered units that have minimum acceptable safeguards against inherent fire hazards.

(5) The ES designated units are electrically powered units that, in addition to all of the requirements for the E units, are provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures. They may be used in some locations where the use of an E unit may not be considered suitable.

(6) The EE designated units are electrically powered units that have, in addition to all of the requirements for the E and ES units, the electric motors and all other electrical equipment completely enclosed. In certain locations the EE unit may be used where the use of an E and ES unit may not be considered suitable.

(7) The EX designated units are electrically powered units that differ from the E, ES, or EE units in that the electrical fittings and equipment are so designed, constructed and assembled that the units may be used in certain atmospheres containing flammable vapors or dusts.

(8) The G designated units are gasoline powered units having minimum acceptable safeguards against inherent fire hazards.

(9) The GS designated units are gasoline powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of a G unit may not be considered suitable.

(10) The LP designated unit is similar to the G unit except that liquefied petroleum gas is used for fuel instead of gasoline.

(11) The LPS designated units are liquefied petroleum gas powered units that are provided with additional safeguards to the exhaust, fuel, and electrical systems. They may be used in some locations where the use of an LP unit may not be considered suitable.

(12) The atmosphere or location shall have been classified as to whether it is hazardous or nonhazardous prior to the consideration of industrial trucks being used therein and the type of industrial truck required shall be as provided in paragraph (d) of this section for such location.

(c) *Designated locations.* (1) The industrial trucks specified under subparagraph (2) of this paragraph are the minimum types required but industrial trucks having greater safeguards may be used if desired.

(2) For specific areas of use see Table N-1 which tabulates the information contained in this section. References in parentheses are to the corresponding classification as used in the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of 1968) for the convenience of persons familiar with those classifications.

TABLE N-1

SUMMARY TABLE ON USE OF INDUSTRIAL TRUCKS IN VARIOUS LOCATIONS

Classes	Unclassified	Class I locations								Class II locations						Class III locations	
Description of classes	Locations not possessing atmospheres as described in other columns.	Locations in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitible mixtures.								Locations which are hazardous because of the presence of combustible dust.						Locations where easily ignitible fibers or flyings are present but not likely to be in suspension in quantities sufficient to produce ignitible mixtures.	
Groups in classes	None	A	B	C	D					E	F	G				None	
Examples of locations or atmospheres in classes and groups	Piers and Wharves inside and outside general storage General industrial or commercial properties	Acetylene	Hydrogen	Ethyl ether	Gasoline Naphtha Alcohols Acetone Lacquer solvent Benzene					Metal dust	Carbon black Coal dust Coke dust	Grain dust Flour dust Starch dust Organic dust				Baled waste, cocoa fiber, cotton, excelsior, hemp, istle, jute, kapok, oakum, sisal, Spanish moss, synthetic fibers, tow.	
		1				2				1			2			1	2
Divisions (Nature of Hazardous Conditions)	None	Above condition exists continuously, intermittently, or periodically under normal operating conditions.				Above condition may occur accidentally as due to a puncture of a storage drum.				Explosive mixture may be present under normal operating conditions, or where failure of equipment may cause the condition to exist simultaneously with arcing or sparking of electrical equipment, or where dusts of an electrically conducting nature may be present.			Explosive mixture not normally present, but where deposits of dust may cause heat rise in electrical equipment, or where such deposits may be ignited by arcs or sparks from electrical equipment.			Locations in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.	Locations in which easily ignitible fibers are stored or handled (except in the process of manufacture).

Authorized uses of trucks by types in groups of classes and divisions

Groups in classes	None	A	B	C	D	A	B	C	D	E	F	G	E	F	G	None	None
Types of trucks authorized:																	
Diesel:																	
Type D	D**																
Type DS									DS						DS		DS
Type DY									DY						DY	DY	DY
Electric:																	
Type E	E**																E
Type ES									ES						ES		ES
Type EE									EE						EE	EE	EE
Type EX					EX				EX		EX	EX			EX	EX	EX
Gasoline:																	
Type G	G**																
Type GS									GS						GS		GS
LP-Gas:																	
Type LP	LP**																
Type LPS									LPS						LPS		LPS
Paragraph Ref. in No. 505	210.211	201 (a)			203 (a)	209 (a)			204 (a), (b)	202 (a)		205 (a)	209 (a)		206 (a) (b)	207 (a)	208 (a)

**Trucks conforming to these Types may also be used—see subdivision (c)(2)(x) and (c)(2)(xii) of this section.

References in parentheses are to the corresponding classification as used in the National Electrical Code (NFPA No. 70, ANSI Standard CI-1968) for the convenience of persons familiar with those classifications.

(i) Power-operated industrial trucks shall not be used in atmospheres containing hazardous concentration of acetylene, butadiene, ethylene oxide, hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas), propylene oxide, acetaldehyde, cyclopropane, diethyl ether, ethylene, isoprene, or unsymmetrical dimethyl hydrazine (UDMH).

(ii) (*a*) Power-operated industrial trucks shall not be used in atmospheres containing hazardous concentrations of metal dust, including aluminum, magnesium, and their commercial alloys, other metals of similarly hazardous characteristics, or in atmospheres containing carbon black, coal or coke dust except approved power-operated industrial trucks designated as EX may be used in such atmospheres.

(*b*) In atmospheres where dust of magnesium, aluminum or aluminum bronze may be present, fuses, switches, motor controllers, and circuit breakers of trucks shall have enclosures specifically approved for such locations.

(iii) Only approved power-operated industrial trucks designated as EX may be used in atmospheres containing acetone, acrylonitrile, alcohol, ammonia, benzine, benzol, butane, ethylene dichloride, gasoline, hexane, lacquer solvent vapors, naphtha, natural gas, propane, propylene, styrene, vinyl acetate, vinyl chloride, or xylenes in quantities sufficient to produce explosive or ignitable mixtures and where such concentrations of these gases or vapors exist continuously, intermittently or periodically under normal operating conditions or may exist frequently because of repair, maintenance operations, leakage, breakdown or faulty operation of equipment.

(iv) Power-operated industrial trucks designated as DY, EE, or EX may be used in locations where volatile flammable liquids or flammable gases are handled, processed or used, but in which the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in the case of abnormal operation of equipment; also in locations in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation but which might become hazardous through failure or abnormal operation of the ventilating equipment; or in locations which are adjacent to Class I, Division 1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clear air, and effective safeguards against ventilation failure are provided.

(v) In locations used for the storage of hazardous liquids in sealed containers or liquified or compressed gases in containers, approved power-operated industrial trucks designated as DS, ES, GS, or LPS may be used. This classification includes locations where volatile flammable liquids or flammable gases or vapors are used, but which, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of hazardous material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that should receive consideration in determining whether or not the DS or DY, ES, EE, GS, LPS designated truck possesses sufficient safeguards for the location. Piping without valves, checks, meters and similar devices would not ordinarily be deemed to introduce a hazardous condition even though used for hazardous liquids or gases. Locations used for the storage of hazardous liquids or of liquified or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.

(vi) (*a*) Only approved power-operated industrial trucks designated as EX shall be used in atmospheres in which combustible dust is or may be in suspension continuously, intermittently, or periodically under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures, or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced.

(*b*) The EX classification usually includes the working areas of grain handling and storage plants, room containing grinders or pulverizers, cleaners, graders, scalpers, open conveyors or spouts, open bins or hoppers, mixers, or blenders, automatic or hopper scales, packing machinery, elevator heads and boots, stock distributors, dust and stock collectors (except all-metal collectors vented to the outside), and all similar dust producing machinery and equipment in grain processing plants, starch plants, sugar pulverizing plants, malting plants, hay grinding plants, and other occupancies of similar nature; coal pulverizing plants (except where the pulverizing equipment is essentially dust tight); all working areas where metal dusts and powders are produced, processed, handled, packed, or stored (except in tight containers); and other similar locations where combustible dust may, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

(vii) Only approved power-operated industrial trucks designated as DY, EE, or EX shall be used in atmospheres in which combustible dust will not normally be in suspension in the air or will not be likely to be thrown into suspension by the normal operation of equipment or apparatus in quantities sufficient to produce explosive or ignitable mixtures but where deposits or accumulations of such dust may be ignited by arcs or sparks originating in the truck.

(viii) Only approved power-operated industrial trucks designated as DY, EE, or EX shall be used in locations which are hazardous because of the presence of easily ignitible fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures.

(ix) Only approved power-operated industrial trucks designated as DS, DY, ES, EE, EX, GS, or LPS shall be used in locations where easily ignitable fibers are stored or handled, including outside storage, but are not being processed or manufactured. Industrial trucks designated as E, which have been previously used in these locations may be continued in use.

(x) On piers and wharves handling general cargo, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements for these types may be used.

(xi) If storage warehouses and outside storage locations are hazardous only the approved power-operated industrial truck specified for such locations in this paragraph (c)(2) shall be used. If not classified as hazardous, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements for these types may be used.

(xii) If general industrial or commercial properties are hazardous, only approved power-operated industrial trucks specified for such locations in this paragraph (c)(2) shall be used. If not classified as hazardous, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements of these types may be used.

(d) *Converted industrial trucks.* Power-operated industrial trucks that have been originally approved for the use of gasoline for fuel, when converted to the use of liquefied petroleum gas fuel in accordance with paragraph (q) of this section, may be used in those locations where G, GS or LP, and LPS designated trucks have been specified in the preceding paragraphs.

(e) *Safety guards.* (1) High Lift Rider trucks shall be fitted with an overhead guard manufactured in accordance with paragraph (a)(2) of this section, unless operating conditions do not permit.

(2) If the type of load presents a hazard, the user shall equip fork trucks with a vertical load backrest extension manufactured in accordance with paragraph (a)(2) of this section.

(f) *Fuel handling and storage.* (1) The storage and handling of liquid fuels such as gasoline and diesel fuel shall be in accordance with NFPA Flammable and Combustible Liquids Code (NFPA No. 30-1969).

(2) The storage and handling of liquefied petroleum gas fuel shall be in accordance with NFPA Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58-1969).

(g) *Changing and charging storage batteries.* (1) Battery charging installations shall be located in areas designated for that purpose.

(2) Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

(3) When racks are used for support of batteries, they should be made of materials nonconductive to spark generation or be coated or covered to achieve this objective.

(4) A conveyor, overhead hoist, or equivalent material handling equipment shall be provided for handling batteries.

(5) Reinstalled batteries shall be properly positioned and secured in the truck.

(6) A carboy tilter or siphon shall be provided for handling electrolyte.

(7) When charging batteries, acid shall be poured into water; water shall not be poured into acid.

(8) Trucks shall be properly positioned and brake applied before attempting to change or charge batteries.

(9) When charging batteries, the vent caps should be kept in place to avoid electrolyte spray. Care shall be taken to assure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat.

(10) Smoking shall be prohibited in the charging area.

(11) Precautions shall be taken to prevent open flames, sparks, or electric arcs in battery charging areas.

(12) Tools and other metallic objects shall be kept away from the top of uncovered batteries.

(h) *Lighting for operating areas.* (1) Controlled lighting of adequate intensity should be provided in operating areas. (See American National Standard Practice for Industrial Lighting, A11.1–1965 (R1970)).

(2) Where general lighting is less than 2 lumens per square foot, auxiliary directional lighting shall be provided on the truck.

(i) *Control of noxious gases and fumes.* (1) Concentration levels of carbon monoxide gas created by powered industrial truck operations shall not exceed the levels specified in § 1910.93.

(2) Questions concerning degree of concentration and methods of sampling to ascertain the conditions should be referred to a qualified industrial hygienist.

(j) *Dockboards (bridge plates).* See § 1910.30(a).

(k) *Trucks and railroad cars.* (1) The brakes of highway trucks shall be set and wheel chocks placed under the rear wheels to prevent the trucks from rolling while they are boarded with powered industrial trucks.

(2) Wheel stops or other recognized positive protection shall be provided to prevent railroad cars from moving during loading or unloading operations.

(3) Fixed jacks may be necessary to support a semitrailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor.

(4) Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.

(l) *Operator training.* Only trained and authorized operators shall be permitted to operate a powered industrial truck. Methods shall be devised to train operators in the safe operation of powered industrial trucks.

(m) *Truck operations.* (1) Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.

(2) No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.

(3) Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.

(4) The employer shall prohibit arms or legs from being placed between the uprights of the mast or outside the running lines of the truck.

(5) When leaving a powered industrial truck unattended, load engaging means shall be fully lowered, controls shall be neutralized, power shut off, brakes set, key or connector plug removed. Wheels shall be blocked if the truck is parked on an incline.

(6) A safe distance shall be maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car. Trucks shall not be used for opening or closing freight doors.

(7) Brakes shall be set and wheel blocks shall be in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor. The flooring of trucks, trailers, and railroad cars shall be checked for breaks and weakness before they are driven onto.

(8) There shall be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.

(9) An overhead guard shall be used as protection against falling objects. It should be noted that an overhead guard is intended to offer protection from the impact of small packages, boxes, bagged material, etc., representative of the job application, but not to withstand the impact of a falling capacity load.

(10) A load backrest extension shall be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.

(11) Only approved industrial trucks shall be used in hazardous locations.

(12) Whenever a truck is equipped with vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions shall be taken for the protection of personnel being elevated.

(i) Use of a safety platform firmly secured to the lifting carriage and/or forks.

(ii) Means shall be provided whereby personnel on the platform can shut off power to the truck.

(iii) Such protection from falling objects as indicated necessary by the operating conditions shall be provided.

(13) Spinner knobs must not be attached to steering handwheels of trucks not originally equipped with such.

(14) Fire aisles, access to stairways, and fire equipment shall be kept clear.

(n) *Traveling.* (1) All traffic regulations shall be observed, including authorized plant speed limits. A safe distance shall be maintained approximately three truck lengths from the truck ahead, and the truck shall be kept under control at all times.

(2) The right of way shall be yielded to ambulances, fire trucks, or other vehicles in emergency situations.

(3) Other trucks traveling in the same direction at intersections, blind spots, or other dangerous locations shall not be passed.

(4) The driver shall be required to slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.

(5) Railroad tracks shall be crossed diagonally wherever possible. Parking closer than 8 feet from the center of railroad tracks is prohibited.

(6) The driver shall be required to look in the direction of, and keep a clear view of the path of travel.

(7) Grades shall be ascended or descended slowly.

(i) When ascending or descending grades in excess of 10 percent, loaded trucks shall be driven with the load upgrade.

(ii) Unloaded trucks should be operated on all grades with the load engaging means downgrade.

(iii) On all grades the load and load engaging means shall be tilted back if applicable, and raised only as far as necessary to clear the road surface.

(8) Under all travel conditions the truck shall be operated at a speed that will permit it to be brought to a stop in a safe manner.

(9) Stunt driving and horseplay shall not be permitted.

(10) The driver shall be required to slow down for wet and slippery floors.

(11) Dockboard or bridgeplates, shall be properly secured before they are driven over. Dockboard or bridgeplates shall be driven over carefully and slowly and their rated capacity never exceeded.

(12) Elevators shall be approached slowly, and then entered squarely after the elevator car is properly leveled. Once on the elevator, the controls shall be neutralized, power shut off, and the brakes set.

(13) Motorized hand trucks must enter elevator or other confined areas with load end forward.

(14) Running over loose objects on the roadway surface shall be avoided.

(15) While negotiating turns, speed shall be reduced to a safe level by means

of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.

(o) *Loading.* (1) Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.

(2) Only loads within the rated capacity of the truck shall be handled.

(3) The long or high (including multiple-tiered) loads which may affect capacity shall be adjusted.

(4) When attachments are used, particular care should be taken in securing, manipulating, positioning, and transporting the load. Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.

(5) A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.

(6) Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

(p) *Operation of the truck.* (1) If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition.

(2) Fuel tanks shall not be filled while the engine is running. Spillage shall be avoided.

(3) Spillage of oil or fuel shall be carefully washed away or completely evaporated and the fuel tank cap replaced before restarting engine.

(4) No truck shall be operated with a leak in the fuel system until the leak has been corrected.

(5) Open flames shall not be used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

(q) *Maintenance of industrial trucks.* (1) Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.

(2) No repairs shall be made in Class I, II, and III locations.

(3) Those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated for such repairs.

(4) Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.

(5) All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design.

(6) Industrial trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except as provided in subparagraph (12) of this paragraph. Additional counterweighting of fork trucks shall not be done unless approved by the truck manufacturer.

(7) Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily.

Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.

(8) Water mufflers shall be filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity. Vehicles with mufflers having screens or other parts that may become clogged shall not be operated while such screens or parts are clogged. Any vehicle that emits hazardous sparks or flames from the exhaust system shall immediately be removed from service, and not returned to service until the cause for the emission of such sparks and flames has been eliminated.

(9) When the temperature of any part of any truck is found to be in excess of its normal operating temperature, thus creating a hazardous condition, the vehicle shall be removed from service and not returned to service until the cause for such overheating has been eliminated.

(10) Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100° F.) solvents shall not be used. High flash point (at or above 100° F.) solvents may be used. Precautions regarding toxicity, ventilation, and fire hazard shall be consonant with the agent or solvent used.

(11) Where it is necessary to use antifreeze in the engine cooling system, only those products having a glycol base shall be used.

(12) Industrial trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas fuel provided the complete conversion results in a truck which embodies the features specified for LP or LPS designated trucks. Such conversion equipment shall be approved. The description of the component parts of this conversion system and the recommended method of installation on specific trucks are contained in the "Listed by Report."

§ 1910.179 Overhead and gantry cranes.

(a) *Definitions applicable to this section.* (1) A "crane" is a machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine. Cranes whether fixed or mobile are driven manually or by power.

(2) An "automatic crane" is a crane which when activated operates through a preset cycle or cycles.

(3) A "cab-operated crane" is a crane controlled by an operator in a cab located on the bridge or trolley.

(4) "Cantilever gantry crane" means a gantry or semigantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.

(5) "Floor-operated crane" means a crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

(6) "Gantry crane" means a crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

(7) "Hot metal handling crane" means an overhead crane used for transporting or pouring molten material.

(8) "Overhead crane" means a crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

(9) "Power-operated crane" means a crane whose mechanism is driven by electric, air, hydraulic, or internal combustion means.

(10) A "pulpit-operated crane" is a crane operated from a fixed operator station not attached to the crane.

(11) A "remote-operated crane" is a crane controlled by an operator not in a pulpit or in the cab attached to the crane, by any method other than pendant or rope control.

(12) A "semigantry crane" is a gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by a truck running on an elevated rail or runway.

(13) "Storage bridge crane" means a gantry type crane of long span usually used for bulk storage of material; the bridge girders or trusses are rigidly or nonrigidly supported on one or more legs. It may have one or more fixed or hinged cantilever ends.

(14) "Wall crane" means a crane having a jib with or without trolley and supported from a side wall or line of columns of a building. It is a traveling type and operates on a runway attached to the side wall or columns.

(15) "Appointed" means assigned specific responsibilities by the employer or the employer's representative.

(16) "ANSI" means the American National Standards Institute.

(17) An "auxiliary hoist" is a supplemental hoisting unit of lighter capacity and usually higher speed than provided for the main hoist.

(18) A "brake" is a device used for retarding or stopping motion by friction or power means.

(19) A "drag brake" is a brake which provides retarding force without external control.

(20) A "holding brake" is a brake that automatically prevents motion when power is off.

(21) "Bridge" means that part of a crane consisting of girders, trucks, end ties, footwalks, and drive mechanism which carries the trolley or trolleys.

(22) "Bridge travel" means the crane movement in a direction parallel to the crane runway.

(23) A "bumper" (buffer) is an energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving cranes or trolleys come in contact.

(24) The "cab" is the operator's compartment on a crane.

(25) "Clearance" means the distance from any part of the crane to a point of the nearest obstruction.

(26) "Collectors current" are contacting devices for collecting current from runway or bridge conductors.

(27) "Conductors, bridge" are the electrical conductors located along the bridge structure of a crane to provide power to the trolley.

(28) "Conductors, runway" (main) are the electrical conductors located along a crane runway to provide power to the crane.

(29) The "control braking means" is a method of controlling crane motor speed when in an overhauling condition.

(30) "Countertorque" means a method of control by which the power to the motor is reversed to develop torque in the opposite direction.

(31) "Dynamic" means a method of controlling crane motor speeds when in the overhauling condition to provide a retarding force.

(32) "Regenerative" means a form of dynamic braking in which the electrical energy generated is fed back into the power system.

(33) "Mechanical" means a method of control by friction.

(34) "Controller, spring return" means a controller which when released will return automatically to a neutral position.

(35) "Designated" means selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

(36) A "drift point" means a point on a travel motion controller which releases the brake while the motor is not energized. This allows for coasting before the brake is set.

(37) The "drum" is the cylindrical member around which the ropes are wound for raising or lowering the load.

(38) An "equalizer" is a device which compensates for unequal length or stretch of a rope.

(39) "Exposed" means capable of being contacted inadvertently. Applied to hazardous objects not adequately guarded or isolated.

(40) "Fail-safe" means a provision designed to automatically stop or safely control any motion in which a malfunction occurs.

(41) "Footwalk" means the walkway with handrail, attached to the bridge or trolley for access purposes.

(42) A "hoist" is an apparatus which may be a part of a crane, exerting a force for lifting or lowering.

(43) "Hoist chain" means the load bearing chain in a hoist.

NOTE: Chain properties do not conform to those shown in ANSI B30.9-1971, Safety Code for Slings.

(44) "Hoist motion" means that motion of a crane which raises and lowers a load.

(45) "Load" means the total superimposed weight on the load block or hook.

(46) The "load block" is the assembly of hook or shackle, swivel, bearing, sheaves, pins, and frame suspended by the hoisting rope.

(47) "Magnet" means an electromagnetic device carried on a crane hook to pick up loads magnetically.

(48) "Main hoist" means the hoist mechanism provided for lifting the maximum rated load.

(49) A "man trolley" is a trolley having an operator's cab attached thereto.

(50) "Rated load" means the maximum load for which a crane or individual hoist is designed and built by the manufacturer and shown on the equipment nameplate(s).

(51) "Rope" refers to wire rope, unless otherwise specified.

(52) "Running sheave" means a sheave which rotates as the load block is raised or lowered.

(53) "Runway" means an assembly of rails, beams, girders, brackets, and framework on which the crane or trolley travels.

(54) "Side pull" means that portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.

(55) "Span" means the horizontal distance center to center of runway rails.

(56) "Standby crane" means a crane which is not in regular service but which is used occasionally or intermittently as required.

(57) A "stop" is a device to limit travel of a trolley or crane bridge. This device normally is attached to a fixed structure and normally does not have energy absorbing ability.

(58) A "switch" is a device for making, breaking, or for changing the connections in an electric circuit.

(59) An "emergency stop switch" is a manually or automatically operated electric switch to cut off electric power independently of the regular operating controls.

(60) A "limit switch" is a switch which is operated by some part or motion of a power-driven machine or equipment to alter the electric circuit associated with the machine or equipment.

(61) A "main switch" is a switch controlling the entire power supply to the crane.

(62) A "master switch" is a switch which dominates the operation of contactors, relays, or other remotely operated devices.

(63) The "trolley" is the unit which travels on the bridge rails and carries the hoisting mechanism.

(64) "Trolley travel" means the trolley movement at right angles to the crane runway.

(65) "Truck" means the unit consisting of a frame, wheels, bearings, and axles which supports the bridge girders or trolleys.

(b) *General requirements*—(1) *Application*. This section applies to overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics. These cranes are grouped because they all have trolleys and similar travel characteristics.

(2) *New and existing equipment*. All new overhead and gantry cranes constructed and installed on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.0-1967. Overhead and gantry cranes constructed before August 31, 1971, should be modified to conform to those design specifications by February 15, 1972, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements of this section.

(3) *Modifications*. Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer. The crane shall be tested in accordance with paragraph (k)(2) of this section. New rated load shall be displayed in accordance with subparagraph (5) of this paragraph.

(4) *Wind indicators and rail clamps*. Outdoor storage bridges shall be provided with automatic rail clamps. A wind-indicating device shall be provided which will give a visible or audible alarm to the bridge operator at a predetermined wind velocity. If the clamps act on the rail heads, any beads or weld flash on the rail heads shall be ground off.

(5) *Rated load marking*. The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block and this marking shall be clearly legible from the ground or floor.

(6) *Clearance from obstruction*. (i) Minimum clearance of 3 inches overhead and 2 inches laterally shall be provided and maintained between crane and obstructions in conformity with Crane Manufacturers Association of America, Inc., Specification No. 61 (formerly the Electric Overhead Crane Institute, Inc).

(ii) Where passageways or walkways are provided obstructions shall not be placed so that safety of personnel will be jeopardized by movements of the crane.

(7) *Clearance between parallel cranes*. If the runways of two cranes are parallel, and there are no intervening walls or structure, there shall be adequate clearance provided and maintained between the two bridges.

(c) *Cabs*—(1) *Cab location*. (i) The general arrangement of the cab and the location of control and protective equipment shall be such that all operating handles are within convenient reach of the operator when facing the area to be served by the load hook, or while facing the direction of travel of the cab. The arrangement shall allow the operator a full view of the load hook in all positions.

(ii) The cab shall be located to afford a minimum of 3 inches clearance from all fixed structures within its area of possible movement.

(iii) The clearance of the cab above the working floor or passageway should be not less than 7 feet.

(2) *Access to crane.* Access to the cab and/or bridge walkway shall be by a conveniently placed fixed ladder, stairs, or platform requiring no step over any gap exceeding 12 inches. Fixed ladders shall be in conformance with the American National Standard Safety Code for Fixed Ladders, ANSI A14.3–1956.

(3) *Fire extinguisher.* A carbon dioxide, dry-chemical, or equivalent hand fire extinguisher should be kept in the cab. Carbon tetrachloride extinguishers shall not be used.

(4) *Lighting.* Light in the cab shall be sufficient to enable the operator to see clearly enough to perform his work.

(d) *Footwalks and ladders*—(1) *Location of footwalks.* (i) If sufficient headroom is available on cab-operated cranes, a footwalk shall be provided on the drive side along the entire length of the bridge of all cranes having the trolley running on the top of the girders. To give sufficient access to the opposite side of the trolley, there should be provided either a footwalk mounted on the trolley, a suitable footwalk or platform in the building, or a footwalk on the opposite side of the crane at least twice the length of the trolley.

(ii) Footwalks should be located to give a headroom not less than 78 inches. In no case shall less than 48 inches be provided. If 48 inches of headroom cannot be provided, footwalks should be omitted from the crane and a stationary platform or landing stage built for workmen making repairs.

(2) *Construction of footwalks.* (i) Footwalks shall be of rigid construction and designed to sustain a distributed load of at least 50 pounds per square foot.

(ii) Footwalks shall have a walking surface of antislip type.

NOTE: Wood will meet this requirement.

(iii) Footwalks should be continuous and permanently secured.

(iv) Footwalks should have a clear passageway at least 18 inches wide except opposite the bridge motor, where they should be not less than 15 inches. The inner edge shall extend at least to the line of the outside edge of the lower cover plate or flange of the girder.

(3) *Toeboards and handrails for footwalks.* Toeboards and handrails shall be in compliance with section 1910.23 of this part.

(4) *Ladders and stairways.* (i) Gantry cranes shall be provided with ladders or stairways extending from the ground to the footwalk or cab platform.

(ii) Stairways shall be equipped with rigid and substantial metal handrails. Walking surfaces shall be of an antislip type.

(iii) Ladders shall be permanently and securely fastened in place and shall be constructed in compliance with § 1910.27.

(e) *Stops, bumpers, rail sweeps, and guards*—(1) *Trolley stops.* (i) Stops shall be provided at the limits of travel of the trolley.

(ii) Stops shall be fastened to resist forces applied when contacted.

(iii) A stop engaging the tread of the wheel shall be of a height at least equal to the radius of the wheel.

(2) *Bridge bumpers.* (i) A crane shall be provided with bumpers capable of stopping the crane (not including the lifted load) at a rate of deceleration not to exceed 3 feet per second per second when traveling in either direction at 20 percent of the rated load speed.

(*a*) The bumper shall have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40 percent of rated load speed.

(*b*) The bumper shall be so mounted that there is no direct shear on bolts.

(ii) Bumpers shall be so designed and installed as to minimize parts falling from the crane in case of breakage.

(3) *Trolley bumpers.* (i) Trolley shall be provided with bumpers capable of stopping the trolley (not including the lifted load) at a rate of deceleration not to exceed 4.7 feet per second per second when traveling in either direction at one-third of the rated load speed.

(ii) When more than one trolley is operated on the same bridge, each shall be equipped with bumpers on adjacent ends.

(iii) Bumpers shall be designed and installed to minimize parts falling from the trolley in case of breakage.

(4) *Rail sweeps.* Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.

(5) *Guards for hoisting ropes.* (i) If hoisting ropes run near enough to other parts to make fouling or chafing possible, guards shall be installed to prevent this condition.

(ii) A guard shall be provided to prevent contact between bridge conductors and hoisting ropes if they could come into contact.

(6) *Guards for moving parts.* (i) Exposed moving parts such as gears, set screws, projecting keys, chains, chain sprockets, and reciprocating components which might constitute a hazard under normal operating conditions shall be guarded.

(ii) Guards shall be securely fastened.

(iii) Each guard shall be capable of supporting without permanent distortion the weight of a 200-pound person unless the guard is located where it is impossible for a person to step on it.

(f) *Brakes*—(1) *Brakes for hoists.* (i) Each independent hoisting unit of a crane shall be equipped with at least one self-setting brake, hereafter referred to as a holding brake, applied directly to the motor shaft or some part of the gear train.

(ii) Each independent hoisting unit of a crane, except worm-geared hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent overspeeding.

(2) *Holding brakes.* (i) Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied.

(*a*) 125 percent when used with a control braking means other than mechanical.

(*b*) 100 percent when used in conjunction with a mechanical control braking means.

(*c*) 100 percent each if two holding brakes are provided.

(ii) Holding brakes on hoists shall have ample thermal capacity for the frequency of operation required by the service.

(iii) Holding brakes on hoists shall be applied automatically when power is removed.

(iv) Where necessary holding brakes shall be provided with adjustment means to compensate for wear.

(v) The wearing surface of all holding-brake drums or discs shall be smooth.

(vi) Each independent hoisting unit of a crane handling hot metal and having power control braking means shall be equipped with at least two holding brakes.

(3) *Control braking means.* (i) A power control braking means such as regenerative, dynamic or countertorque braking, or a mechanically controlled braking means shall be capable of maintaining safe lowering speeds of rated loads.

(ii) The control braking means shall have ample thermal capacity for the frequency of operation required by service.

(4) *Brakes for trolleys and bridges.* (i) Foot operated brakes shall not require an applied force of more than 70 pounds to develop manufacturer's rated brake torque.

(ii) Brakes may be applied by mechanical, electrical, pneumatic, hydraulic, or gravity means.

(iii) Where necessary brakes shall be provided with adjustment means to compensate for wear.

(iv) The wearing surface of all brake-drums or discs shall be smooth.

(v) All foot-brake pedals shall be constructed so that the operator's foot will not easily slip off the pedal.

(vi) Foot-operated brakes shall be equipped with automatic means for positive release when pressure is released from the pedal.

(vii) Brakes for stopping the motion of the trolley or bridge shall be of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load.

(viii) If holding brakes are provided on the bridge or trolleys, they shall not prohibit the use of a drift point in the control circuit.

(ix) Brakes on trolleys and bridges shall have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions from overheating.

(5) *Application of trolley brakes.* (i) On cab-operated cranes with cab on trolley, a trolley brake shall be required as specified under subparagraph (4) of this paragraph.

(ii) A drag brake may be applied to hold the trolley in a desired position on the bridge and to eliminate creep with the power off.

(6) *Application of bridge brakes.* (i) On cab-operated cranes with cab on bridge, a bridge brake is required as specified under subparagraph (4) of this paragraph.

(ii) On cab-operated cranes with cab on trolley, a bridge brake of the holding type shall be required.

(iii) On all floor, remote and pulpit-operated crane bridge drives, a brake or noncoasting mechanical drive shall be provided.

(g) *Electric equipment*—(1) *General.* (i) Wiring and equipment shall comply with § 1910.309.

(ii) The control circuit voltage shall not exceed 600 volts for a.c. or d.c. current.

(iii) The voltage at pendant pushbuttons shall not exceed 150 volts for a.c. and 300 volts for d.c.

(iv) Where multiple conductor cable is used with a suspended pushbutton station, the station must be supported in some satisfactory manner that will protect the electrical conductors against strain.

(v) Pendant control boxes shall be constructed to prevent electrical shock and shall be clearly marked for identification of functions.

(2) *Equipment.* (i) Electrical equipment shall be so located or enclosed that live parts will not be exposed to accidental contact under normal operating conditions.

(ii) Electric equipment shall be protected from dirt, grease, oil, and moisture.

(iii) Guards for live parts shall be substantial and so located that they cannot be accidently deformed so as to make contact with the live parts.

(3) *Controllers.* (i) Cranes not equipped with spring-return controllers or momentary contact pushbuttons shall be provided with a device which will disconnect all motors from the line on failure of power and will not permit any motor to be restarted until the controller handle is brought to the "off" position, or a reset switch or button is operated.

(ii) Lever operated controllers shall be provided with a notch or latch which in the "off" position prevents the handle from being inadvertently moved to the "on" position. An "off" detent or spring return arrangement is acceptable.

(iii) The controller operating handle shall be located within convenient reach of the operator.

(iv) As far as practicable, the movement of each controller handle shall be in the same general directions as the resultant movements of the load.

(v) The control for the bridge and trolley travel shall be so located that the operator can readily face the direction of travel.

(vi) For floor-operated cranes, the controller or controllers if rope operated, shall automatically return to the "off" position when released by the operator.

(vii) Pushbuttons in pendant stations shall return to the "off" position when pressure is related by the crane operator.

(viii) Automatic cranes shall be so designed that all motions shall fail-safe if any malfunction of operation occurs.

(ix) Remote-operated cranes shall function so that if the control signal for any crane motion becomes ineffective the crane motion shall stop.

(4) *Resistors.* (i) Enclosures for resistors shall have openings to provide adequate ventilation, and shall be installed to prevent the accumulation of combustible matter too near to hot parts.

(ii) Resistor units shall be supported so as to be as free as possible from vibration.

(iii) Provision shall be made to prevent broken parts or molten metal falling upon the operator or from the crane.

(5) *Switches.* (i) The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position.

(ii) On cab-operated cranes a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within easy reach of the operator.

(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided:

(*a*) Nonconductive rope attached to the main disconnect switch.

(*b*) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton in the pendant pushbutton station.

(*c*) A main line contactor operated by a switch or pushbutton in the pendant pushbutton station.

(iv) The hoisting motion of all electric traveling cranes shall be provided with an overtravel limit switch in the hoisting direction.

(v) All cranes using a lifting magnet shall have a magnet circuit switch of the enclosed type with provision for locking in the open position. Means for discharging the inductive load of the magnet shall be provided.

(6) *Runway conductors.* Conductors of the open type mounted on the crane runway beams or overhead shall be so located or so guarded that persons entering or leaving the cab or crane footwalk normally could not come into contact with them.

(7) *Extension lamps.* If a service receptacle is provided in the cab or on the bridge of cab-operated cranes, it shall be a grounded three-prong type permanent receptacle, not exceeding 300 volts.

(h) *Hoisting equipment*—(1) *Sheaves.* (i) Sheave grooves shall be smooth and free from surface defects which could cause rope damage.

(ii) Sheaves carrying ropes which can be momentarily unloaded shall be provided with close-fitting guards or other suitable devices to guide the rope back into the groove when the load is applied again.

(iii) The sheaves in the bottom block shall be equipped with close-fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with ropes loose.

(iv) Pockets and flanges of sheaves used with hoist chains shall be of such dimensions that the chain does not catch or bind during operation.

(v) All running sheaves shall be equipped with means for lubrication. Permanently lubricated, sealed and/or shielded bearings meet this requirement.

(2) *Ropes.* (i) In using hoisting ropes, the crane manufacturer's recommendation shall be followed. The rated load divided by the number of parts of rope shall not exceed 20 percent of the nominal breaking strength of the rope.

(ii) Socketing shall be done in the manner specified by the manufacturer of the assembly.

(iii) Rope shall be secured to the drum as follows:

(*a*) No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position.

(*b*) Rope end shall be anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer.

(iv) Eye splices. [Reserved.]

(v) Rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope. Spacing and number of all types of clips shall be in accordance with the clip manufacturer's recommendation. Clips shall be drop-forged steel in all sizes manufactured commercially. When a newly installed rope has been in operation for an hour, all nuts on the clip bolts shall be retightened.

(vi) Swaged or compressed fittings shall be applied as recommended by the rope or crane manufacturer.

(vii) Wherever exposed to temperatures, at which fiber cores would be damaged, rope having an independent wire-rope or wire-strand core, or other temperature-damage resistant core shall be used.

(viii) Replacement rope shall be the same size, grade, and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a wire rope manufacturer due to actual working condition requirements.

(3) *Equalizers.* If a load is supported by more than one part of rope, the tension in the parts shall be equalized.

(4) *Hooks.* Hooks shall meet the manufacturer's recommendations and shall not be overloaded.

(i) *Warning device.* Except for floor-operated cranes a gong or other effective warning signal shall be provided for each crane equipped with a power traveling mechanism.

(j) *Inspection*—(1) *Inspection classification.* (i) Initial inspection. Prior to initial use all new and altered cranes shall be inspected to insure compliance with the provisions of this section.

(ii) Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic" with respective intervals between inspections as defined below:

(*a*) Frequent inspection—Daily to monthly intervals.

(*b*) Periodic inspection—1 to 12-month intervals.

(2) *Frequent inspection.* The following items shall be inspected for defects at intervals as defined in subparagraph (1)(ii) of this paragraph or as specifically indicated, including observation during operation for any defects which might appear between regular inspections. All deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

(i) All functional operating mechanisms for maladjustment interfering with proper operation. Daily.

(ii) Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. Daily.

(iii) Hooks with deformation or cracks. Visual inspection daily; monthly inspection with signed reports. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook refer to paragraph (l)(3)(iii)(*a*) of this section.

(iv) Hoist or load attachment chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations. Visual inspection daily; monthly inspection with signed report.

(v) Rope slings, including end connections, for excessive wear, broken wires, stretch, kinking, or twisting. Visual inspection daily; monthly inspection with signed report.

(vi) All functional operating mechanisms for excessive wear of components.

(vii) Rope reeving for noncompliance with manufacturer's recommendations.

(3) *Periodic inspection.* Complete inspections of the crane shall be performed at intervals as generally defined in subparagraph (1)(ii)(*b*) of this paragraph, depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of subparagraph (2) of this paragraph and in addition, the following items. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

(i) Deformed, cracked, or corroded members.

(ii) Loose bolts or rivets.

(iii) Cracked or worn sheaves and drums.

(iv) Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.

(v) Excessive wear on brake system parts, linings, pawls, and ratchets.

(vi) Load, wind, and other indicators over their full range, for any significant inaccuracies.

(vii) Gasoline, diesel, electric, or other powerplants for improper performance or noncompliance with applicable safety requirements.

(viii) Excessive wear of chain drive sprockets and excessive chain stretch.

(ix) Crane hooks. Magnetic particle or other suitable crack detecting inspection should be performed at least once each year.

(x) Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.

(4) *Cranes not in regular use.* (i) A crane which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming with requirements of subparagraph (2) of this paragraph and paragraph (m)(2) of this section before placing in service.

(ii) A crane which has been idle for a period of over 6 months shall be given a complete inspection conforming with requirements of subparagraphs (2) and (3) of this paragraph and paragraph (m)(2) of this section before placing in service.

(iii) Standby cranes shall be inspected at least semi-annually in accordance with requirements of subparagraph (2) of this paragraph and paragraph (m)(2) of this section. Standby cranes exposed to adverse environment should be inspected more frequently.

(k) *Testing*—(1) *Operational tests.* (i) Prior to initial use all new and altered cranes shall be tested to insure compliance with this section including the following functions:

(*a*) Hoisting and lowering.

(*b*) Trolley travel.

(*c*) Bridge travel.

(*d*) Limit switches, locking and safety devices.

(ii) The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.

(2) *Rated load test.* Prior to initial use all new, extensively repaired, and altered cranes should be tested by or under the direction of an appointed or authorized person, confirming the load rating of the crane. The load rating should not be more than 80 percent of the maximum load sustained during the test. Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel.

(l) *Maintenance*—(1) *Preventive maintenance.* A preventive maintenance program based on the crane manufacturer's recommendations shall be established.

(2) *Maintenance procedure.* (i) Before adjustments and repairs are started on a crane the following precautions shall be taken:

(*a*) The crane to be repaired shall be run to a location where it will cause the least interference with other cranes and operations in the area.

(*b*) All controllers shall be at the off position.

(*c*) The main or emergency switch shall be open and locked in the open position.

(*d*) Warning or "out of order" signs shall be placed on the crane, also on the floor beneath or on the hook where visible from the floor.

(*e*) Where other cranes are in operation on the same runway, rail stops or other suitable means shall be provided to prevent interference with the idle crane.

(*f*) Where temporary protective rail stops are not available, or practical, a signalman should be placed at a visual vantage point for observing the approach of an active crane and warning its operator when reaching the limit of safe distance from the idle crane.

(ii) After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated and maintenance equipment removed.

(3) *Adjustments and repairs.* (i) Any unsafe conditions disclosed by the inspection requirements of paragraph (j) of this section shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.

(ii) Adjustments shall be maintained to assure correct functioning of components. The following are examples:

(*a*) All functional operating mechanisms.

(*b*) Limit switches.

(*c*) Control systems.

(*d*) Brakes.

(*e*) Power plants.

(iii) Repairs or replacements shall be provided promptly as needed for safe operation. The following are examples:

(*a*) Crane hooks showing defects described in paragraph (j)(2)(iii) of this section shall be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted they shall only be done under competent supervision and the hook shall be tested to the load requirements of paragraph (k)(2) of this section before further use.

(*b*) Load attachment chains and rope slings showing defects described in paragraph (j)(2)(iv) and (v) of this section respectively.

(c) All critical parts which are cracked, broken, bent, or excessively worn.

(d) Pendant control stations shall be kept clean and function labels kept legible.

(m) *Rope inspection*—(1) *Running ropes*. A thorough inspection of all ropes shall be made at least once a month and a full written, dated, and signed report of rope condition kept on file where readily available to appointed personnel. Any deterioration, resulting in appreciable loss of original strength, such as described below, shall be carefully noted and determination made as to whether further use of the rope would constitute a safety hazard:

(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.

(ii) A number of broken outside wires and the degree of distribution or concentration of such broken wires.

(iii) Worn outside wires.

(iv) Corroded or broken wires at end connections.

(v) Corroded, cracked, bent, worn, or improperly applied end connections.

(vi) Severe kinking, crushing, cutting, or unstranding.

(2) *Other ropes*. All rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given a thorough inspection before it is placed in service. This inspection shall be for all types of deterioration and shall be performed by an appointed person whose approval shall be required for further use of the rope. A written and dated report of the rope condition shall be available for inspection.

(n) *Handling the load*—(1) *Size of load*. The crane shall not be loaded beyond its rated load except for test purposes as provided in paragraph (k) of this section.

(2) *Attaching the load*. (i) The hoist chain or hoist rope shall be free from kinks or twists and shall not be wrapped around the load.

(ii) The load shall be attached to the load block hook by means of slings or other approved devices.

(iii) Care shall be taken to make certain that the sling clears all obstacles.

(3) *Moving the load*. (i) The load shall be well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.

(ii) Before starting to hoist the following conditions shall be noted:

(*a*) Hoist rope shall not be kinked.

(*b*) Multiple part lines shall not be twisted around each other.

(*c*) The hook shall be brought over the load in such a manner as to prevent swinging.

(iii) During hoisting care shall be taken that:

(*a*) There is no sudden acceleration or deceleration of the moving load.

(*b*) The load does not contact any obstructions.

(iv) Cranes shall not be used for side pulls except when specifically authorized by a responsible person who has determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed.

(v) While any employee is on the load or hook, there shall be no hoisting, lowering, or traveling.

(vi) The employer shall require that the operator avoid carrying loads over people.

(vii) The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes.

(viii) The load shall not be lowered below the point where less than two full wraps of rope remain on the hoisting drum.

(ix) When two or more cranes are used to lift a load one qualified responsible person shall be in charge of the operation. He shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.

(x) The employer shall insure that the operator does not leave his position at the controls while the load is suspended.

(xi) When starting the bridge and when the load or hook approaches near or over personnel, the warning signal shall be sounded.

(4) *Hoist limit switch*. (i) At the beginning of each operator's shift, the upper limit switch of each hoist shall be tried out under no load. Extreme care shall be exercised; the block shall be "inched" into the limit or run in at slow speed. If the switch does not operate properly, the appointed person shall be immediately notified.

(ii) The hoist limit switch which controls the upper limit of travel of the load block shall never be used as an operating control.

(o) *Other requirements, general*—(1) *Ladders*. (i) The employer shall insure that hands are free from encumbrances while personnel are using ladders.

(ii) Articles which are too large to be carried in pockets or belts shall be lifted and lowered by hand line.

(2) *Cabs*. (i) Necessary clothing and personal belongings shall be stored in such a manner as not to interfere with access or operation.

(ii) Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.

(3) *Fire extinguishers*. The employer shall insure that operators are familiar with the operation and care of fire extinguishers provided.

§ 1910.180 Crawler locomotive and truck cranes.

(a) *Definitions applicable to this section*. (1) A "crawler crane" consists of a rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads for travel. Its function is to hoist and swing loads at various radii.

(2) A "locomotive crane" consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on a base or car equipped for travel on railroad track. It may be self-propelled or propelled by an outside source. Its function is to hoist and swing loads at various radii.

(3) A "truck crane" consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on an automotive truck equipped with a powerplant for travel. Its function is to hoist and swing loads at various radii.

(4) A "wheel mounted crane" (wagon crane) consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by the engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure. Its function is to hoist and swing loads at various radii.

(5) An "accessory" is a secondary part or assembly of parts which contributes to the overall function and usefulness of a machine.

(6) "Appointed" means assigned specific responsibilities by the employer or the employer's representative.

(7) "ANSI" means the American National Standards Institute.

(8) An "angle indicator" (boom) is an accessory which measures the angle of the boom to the horizontal.

(9) The "axis of rotation" is the vertical axis around which the crane superstructure rotates.

(10) "Axle" means the shaft or spindle with which or about which a wheel rotates. On truck- and wheel-mounted cranes it refers to an automotive type of axle assembly including housings, gearing, differential, bearings, and mounting appurtenances.

(11) "Axle" (bogie) means two or more automotive-type axles mounted in tandem in a frame so as to divide the load between the axles and permit vertical oscillation of the wheels.

(12) The "base" (mounting) is the traveling base or carrier on which the rotating superstructure is mounted such as a car, truck, crawlers, or wheel platform.

(13) The "boom" (crane) is a member hinged to the front of the rotating superstructure with the outer end supported by ropes leading to a gantry or A-frame and used for supporting the hoisting tackle.

(14) The "boom angle" is the angle between the longitudinal centerline of the boom and the horizontal. The boom longitudinal centerline is a straight line between the boom foot pin (heel pin) centerline and boom point sheave pin centerline.

(15) The "boom hoist" is a hoist drum and rope reeving system used to raise and lower the boom. The rope system may be all live reeving or a combination of live reeving and pendants.

(16) The "boom stop" is a device used to limit the angle of the boom at the highest position.

(17) A "brake" is a device used for retarding or stopping motion by friction or power means.

(18) A "cab" is a housing which covers the rotating superstructure machinery and/or operator's station. On truck-crane trucks a separate cab covers the driver's station.

(19) The "clutch" is a friction, electromagnetic, hydraulic, pneumatic, or positive mechanical device for engagement or disengagement of power.

(20) The "counterweight" is a weight used to supplement the weight of the machine in providing stability for lifting working loads.

(21) "Designated" means selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

(22) The "drum" is the cylindrical members around which ropes are wound for raising and lowering the load or boom.

(23) "Dynamic" (loading) means loads introduced into the machine or its components by forces in motion.

(24) The "gantry" (A-frame) is a structural frame, extending above the superstructure, to which the boom support ropes are reeved.

(25) A "jib" is an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles.

(26) "Load" (working) means the external load, in pounds, applied to the crane, including the weight of load-attaching equipment such as load blocks, shackles, and slings.

(27) "Load block" (upper) means the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended from the boom point.

(28) "Load block" (lower) means the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

(29) A "load hoist" is a hoist drum and rope reeving system used for hoisting and lowering loads.

(30) "Load ratings" are crane ratings in pounds established by the manufacturer in accordance with paragraph (c) of this section.

(31) "Outriggers" are extendable or fixed metal arms, attached to the mounting base, which rest on supports at the outer ends.

(32) "Rail clamp" means a tong-like metal device, mounted on a locomotive crane car, which can be connected to the track.

(33) "Reeving" means a rope system in which the rope travels around drums and sheaves.

(34) "Rope" refers to a wire rope unless otherwise specified.

(35) "Side loading" means a load applied at an angle to the vertical plane of the boom.

(36) A "standby crane" is a crane which is not in regular service but which is used occasionally or intermittently as required.

(37) A "standing (guy) rope" is a supporting rope which maintains a constant distance between the points of attachment to the two components connected by the rope.

(38) "Structural competence" means the ability of the machine and its components to withstand the stresses imposed by applied loads.

(39) "Superstructure" means the rotating upper frame structure of the machine and the operating machinery mounted thereon.

(40) "Swing" means the rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.

(41) "Swing mechanism" means the machinery involved in providing rotation of the superstructure.

(42) "Tackle" is an assembly of ropes and sheaves arranged for hoisting and pulling.

(43) "Transit" means the moving or transporting of a crane from one jobsite to another.

(44) "Travel" means the function of the machine moving from one location to another, on a jobsite.

(45) The "travel mechanism" is the machinery involved in providing travel.

(46) "Wheelbase" means the distance between centers of front and rear axles. For a multiple axle assembly the axle center for wheelbase measurement is taken as the midpoint of the assembly.

(47) The "whipline" (auxiliary hoist) is a separate hoist rope system of lighter load capacity and higher speed than provided by the main hoist.

(48) A "winch head" is a power driven spool for handling of loads by means of friction between fiber or wire rope and spool.

(b) *General requirements*—(1) *Application.* This section applies to crawler cranes, locomotive cranes, wheel mounted cranes of both truck and self-propelled wheel type, and any variations thereof which retain the same fundamental characteristics. This section includes only cranes of the above types, which are basically powered by internal combustion engines or electric motors and which utilize drums and ropes. Cranes designed for railway and automobile wreck clearances are excepted. The requirements of this section are applicable only to machines when used as lifting cranes.

(2) *New and existing equipment.* All new crawler, locomotive, and truck cranes constructed and utilized on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Crawler, Locomotive, and Truck Cranes, ANSI B30.5–1968. Crawler, locomotive, and truck cranes constructed prior to August 31, 1971, should be modified to conform to those design specifications by February 15, 1972, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements of this section.

(c) *Load ratings*—(1) *Load ratings—where stability governs lifting performance.* (i) The margin of stability for determination of load ratings, with booms of stipulated lengths at stipulated working radii for the various types of crane mountings, is established by taking a percentage of the loads which will produce a condition of tipping or balance with the boom in the least stable direction, relative to the mounting. The load ratings shall not exceed the following percentages for cranes, with the indicated types of mounting under conditions stipulated in subdivisions (ii) and (iii) of this subparagraph.

Type of crane mounting	*Maximum load ratings (percent of tipping loads)*
Locomotive, without outriggers:	
Booms 60 feet or less	85
Booms over 60 feet	[1] 85
Locomotive, using outriggers fully extended	80
Crawler, without outriggers	75
Crawler, using outriggers fully extended	85
Truck and wheel mounted without outriggers or using outriggers fully extended	85

[1] Unless this results in less than 30,000 pound-feet net stabilizing moment about the rail, which shall be minimum with such booms.

(ii) The following stipulations shall govern the application of the values in subdivision (i) of this subparagraph for locomotive cranes:

(*a*) Tipping with or without the use of outriggers occurs when half of the wheels farthest from the load leave the rail.

(*b*) The crane shall be standing on track which is level within 1 percent grade.

(*c*) Radius of the load is the horizontal distance from a projection of the axis of rotation to the rail support surface, before loading, to the center of vertical hoist line or tackle with load applied.

(*d*) Tipping loads from which ratings are determined shall be applied under static conditions only, i.e., without dynamic effect of hoisting, lowering, or swinging.

(*e*) The weight of all auxiliary handling devices such as hoist blocks, hooks, and slings shall be considered a part of the load rating.

(iii) Stipulations governing the application of the values in subdivision (i) of this subparagraph for crawler, truck, and wheel-mounted cranes shall be in accordance with Crane Load-Stability Test Code, Society of Automotive Engineers (SAE) J765.

(iv) The effectiveness of these preceding stability factors will be influenced by such additional factors as freely suspended loads, track, wind, or ground conditions, condition and inflation of rubber tires, boom lengths, proper operating speeds for existing conditions, and, in general, careful and competent operation. All of these shall be taken into account by the user.

(2) *Load rating chart.* A substantial and durable rating chart with clearly legible letters and figures shall be provided with each crane and securely fixed to the crane cab in a location easily

visible to the operator while seated at his control station.

(d) *Inspection classification*—(1) *Initial inspection.* Prior to initial use all new and altered cranes shall be inspected to insure compliance with provisions of this section.

(2) *Regular inspection.* Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic", with respective intervals between inspections as defined below:

(i) Frequent inspection: Daily to monthly intervals.

(ii) Periodic inspection: 1- to 12-month intervals, or as specifically recommended by the manufacturer.

(3) *Frequent inspection.* Items such as the following shall be inspected for defects at intervals as defined in subdivision (2)(i) of this subparagraph or as specifically indicated including observation during operation for any defects which might appear between regular inspections. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

(i) All control mechanisms for maladjustment interfering with proper operation: Daily.

(ii) All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.

(iii) All safety devices for malfunction.

(iv) Deterioration or leakage in air or hydraulic systems: Daily.

(v) Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook.

(vi) Rope reeving for noncompliance with manufacturer's recommendations.

(vii) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

(4) *Periodic inspection.* Complete inspections of the crane shall be performed at intervals as generally defined in subparagraph (2)(ii) of this paragraph depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of subparagraph (3) of this paragraph and in addition, items such as the following. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

(i) Deformed, cracked, or corroded members in the crane structure and boom.

(ii) Loose bolts or rivets.

(iii) Cracked or worn sheaves and drums.

(iv) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.

(v) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.

(vi) Load, boom angle, and other indicators over their full range, for any significant inaccuracies.

(vii) Gasoline, diesel, electric, or other power plants for improper performance or noncompliance with safety requirements.

(viii) Excessive wear of chain-drive sprockets and excessive chain stretch.

(ix) Travel steering, braking, and locking devices, for malfunction.

(x) Excessively worn or damaged tires.

(5) *Cranes not in regular use.* (i) A crane which has been idle for a period of one month or more, but less than 6 months, shall be given an inspection conforming with requirements of subparagraph (3) of this paragraph and paragraph (g)(2)(ii) of this section before placing in service.

(ii) A crane which has been idle for a period of six months shall be given a complete inspection conforming with requirements of subparagraphs (3) and (4) of this paragraph and paragraph (g)(2)(ii) of this section before placing in service.

(iii) Standby cranes shall be inspected at least semiannually in accordance with requirements of subparagraph (3) of this paragraph and paragraph (g)(2)(ii) of this section. Such cranes which are exposed to adverse environment should be inspected more frequently.

(6) *Inspection records.* Written, dated, and signed inspection reports and records shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. Records shall be kept readily available.

(e) *Testing*—(1) *Operational tests.* (i) In addition to prototype tests and quality-control measures, each new production crane shall be tested by the manufacturer to the extent necessary to insure compliance with the operational requirements of this paragraph including functions such as the following:

(*a*) Load hoisting and lowering mechanisms

(*b*) Boom hoisting and lower mechanisms

(*c*) Swinging mechanism

(*d*) Travel mechanism

(*e*) Safety devices

(ii) Where the complete production crane is not supplied by one manufacturer such tests shall be conducted at final assembly.

(iii) Certified production-crane test results shall be made available.

(2) *Rated load test.* (i) Written reports shall be available showing test procedures and confirming the adequacy of repairs or alterations.

(ii) Test loads shall not exceed 110 percent of the rated load at any selected working radius.

(iii) Where rerating is necessary:

(*a*) Crawler, truck, and wheel-mounted cranes shall be tested in accordance with SAE Recommended Practice, Crane Load Stability Test Code J765 (April 1961).

(*b*) Locomotive cranes shall be tested in accordance with paragraph (c)(1)(i) and (ii) of this section.

(c) Rerating test report shall be readily available.

(iv) No cranes shall be rerated in excess of the original load ratings unless such rating changes are approved by the crane manufacturer or final assembler.

(f) *Maintenance procedure*—(1) *General.* After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.

(g) *Rope inspection*—(1) *Running ropes.* A thorough inspection of all ropes in use shall be made at least once a month and a full written, dated, and signed report of rope condition kept on file where readily available. All inspections shall be performed by an appointed or authorized person. Any deterioration, resulting in appreciable loss of original strength, such as described below, shall be carefully noted and determination made as to whether further use of the rope would constitute a safety hazard:

(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.

(ii) A number of broken outside wires and the degree of distribution of concentration of such broken wires.

(iii) Worn outside wires.

(iv) Corroded or broken wires at end connections.

(v) Corroded, cracked, bent, worn, or improperly applied end connections.

(vi) Severe kinking, crushing, cutting, or unstranding.

(2) *Other ropes.* (i) Heavy wear and/or broken wires may occur in sections in contact with equalizer sheaves or other sheaves where rope travel is limited, or with saddles. Particular care shall be taken to inspect ropes at these locations.

(ii) All rope which has been idle for a period of a month or more due to shut down or storage of a crane on which it is installed shall be given a thorough inspection before it is placed in service. This inspection shall be for all types of deterioration and shall be performed by an appointed or authorized person whose approval shall be required for further use of the rope. A written and dated report of the rope condition shall be available.

(iii) Particular care shall be taken in the inspection of nonrotating rope.

(h) *Handling the load*—(1) *Size of load.* (i) No crane shall be loaded beyond the rated load, except for test purposes as provided in paragraph (e) of this section.

(ii) When loads which are limited by structural competence rather than by stability are to be handled, it shall be ascertained that the weight of the load has been determined within plus or minus 10 percent before it is lifted.

(2) *Attaching the load.* (i) The hoist rope shall not be wrapped around the load.

(ii) The load shall be attached to the hook by means of slings or other approved devices.

(3) *Moving the load* (i) The employer shall assure that:

(*a*) The crane is level and where necessary blocked properly.

(*b*) The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.

(ii) Before starting to hoist, the following conditions shall be noted:

(*a*) Hoist rope shall not be kinked.

(*b*) Multiple part lines shall not be twisted around each other.

(*c*) The hook shall be brought over the load in such a manner as to prevent swinging.

(*d*) If there is a slack rope condition, it should be determined that the rope is properly seated on the drum and in the sheaves.

(iii) During hoisting care shall be taken that:

(*a*) There is no sudden acceleration or deceleration of the moving load.

(*b*) The load does not contact any obstructions.

(iv) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.

(v) No hoisting, lowering, swinging, or traveling shall be done while anyone is on the load or hook.

(vi) The operator should avoid carrying loads over people.

(vii) On truck-mounted cranes, no loads shall be lifted over the front area except as approved by the crane manufacturer.

(viii) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.

(ix) Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the manufacturer for that crane. Where floats are used they shall be securely attached to the outriggers. Wood blocks used to support outriggers shall:

(*a*) Be strong enough to prevent crushing.

(*b*) Be free from defects.

(*c*) Be of sufficient width and length to prevent shifting or toppling under load.

(x) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.

(xi) Before lifting loads with locomotive cranes without using outriggers, means shall be applied to prevent the load from being carried by the truck springs.

(xii) When two or more cranes are used to lift one load, one designated person shall be responsible for the operation. He shall be required to analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.

(xiii) In transit the following additional precautions shall be exercised:

(*a*) The boom shall be carried in line with the direction of motion.

(*b*) The superstructure shall be secured against rotation, except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly.

(*c*) The empty hook shall be lashed or otherwise restrained so that it cannot swing freely.

(xiv) Before traveling a crane with load, a designated person shall be responsible for determining and controlling safety. Decisions such as position of load, boom location, ground support, travel route, and speed of movement shall be in accord with his determinations.

(xv) A crane with or without load shall not be traveled with the boom so high that it may bounce back over the cab.

(xvi) When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radii at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.

(xvii) When a crane is to be operated at a fixed radius, the boom-hoist pawl or other positive locking device shall be engaged.

(xviii) Ropes shall not be handled on a winch head without the knowledge of the operator.

(xix) While a winch head is being used, the operator shall be within convenient reach of the power unit control lever.

(4) *Holding the load.* (i) The operator shall not be permitted to leave his position at the controls while the load is suspended.

(ii) No person should be permitted to stand or pass under a load on the hook.

(iii) If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive controllable means of the operator's station.

(i) *Other requirements*—(1) *Rail clamps.* Rail clamps shall not be used as a means of restraining tipping of a locomotive crane.

(2) *Ballast or counterweight.* Cranes shall not be operated without the full amount of any ballast or counterweight in place as specified by the maker, but truck cranes that have dropped the ballast or counterweight may be operated temporarily with special care and only for light loads without full ballast or counterweight in place. The ballast or counterweight in place specified by the manufacturer shall not be exceeded.

(3) *Cabs.* (i) Necessary clothing and personal belongings shall be stored in such a manner as to not interfere with access or operation.

(ii) Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.

(4) *Refueling.* (i) Refueling with small portable containers shall be done with Underwriters' Laboratories or Factory Mutual Laboratories approved, or equivalent, safety type can equipped with an automatic closing cap and flame arrester.

(ii) Machines shall not be refueled with the engine running.

(5) *Fire extinguishers.* (i) A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or vicinity of the crane.

(ii) Operating and maintenance personnel shall be made familiar with the use and care of the fire extinguishers provided.

(6) *Swinging locomotive cranes.* A locomotive crane shall not be swung into a position where railway cars on an adjacent track might strike it, until it has been ascertained that cars are not being moved on the adjacent track and proper flag protection has been established.

(j) *Operating near electric power lines*—(1) *Clearances.* Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers not a part of or an attachment to the crane have been erected to prevent physical contact with the lines, cranes shall be operated proximate to, under, over, by, or near powerlines only in accordance with the following:

(i) For lines rated 50 kv. or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.

(ii) For lines rated over 50 kv. minimum, clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kv. over 50 kv., or twice the length of the line insulator but never less than 10 feet.

(iii) In transit with no load and boom lowered the clearance shall be a minimum of 4 feet.

(2) *Boom guards.* Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not operate to alter the requirements of subparagraph (1) of this paragraph.

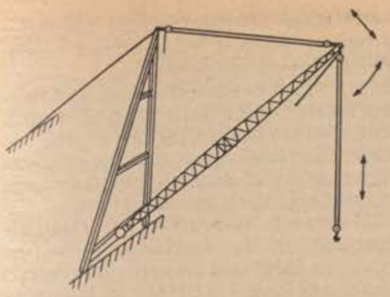
(3) *Notification.* Before the commencement of operations near electrical lines, the owners of the lines or their authorized representative shall be notified and provided with all pertinent information. The cooperation of the owner shall be requested.

(4) *Overhead wires.* Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line.

§ 1910.181 Derricks.

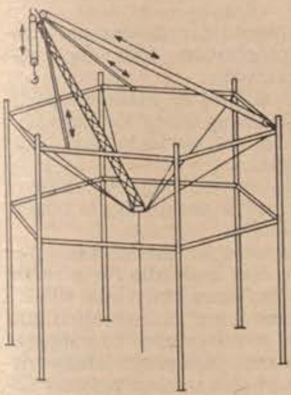
(a) *Definitions applicable to this section.* (1) A "derrick" is an apparatus consisting of a mast or equivalent member held at the head by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

(2) "A-frame derrick" means a derrick in which the boom is hinged from a cross member between the bottom ends of two upright members spread apart at the lower ends and joined at the top; the boom point secured to the junction of the side members, and the side members are braced or guyed from this junction point.



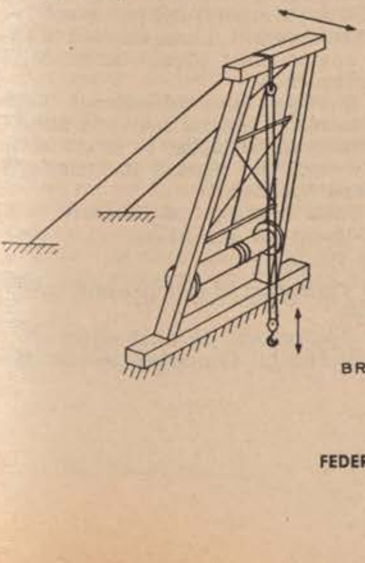
A-FRAME

(3) A "basket derrick" is a derrick without a boom, similar to a gin pole, with its base supported by ropes attached to corner posts or other parts of the structure. The base is at a lower elevation than its supports. The location of the base of a basket derrick can be changed by varying the length of the rope supports. The top of the pole is secured with multiple reeved guys to position the top of the pole to the desired location by varying the length of the upper guy lines. The load is raised and lowered by ropes through a sheave or block secured to the top of the pole.



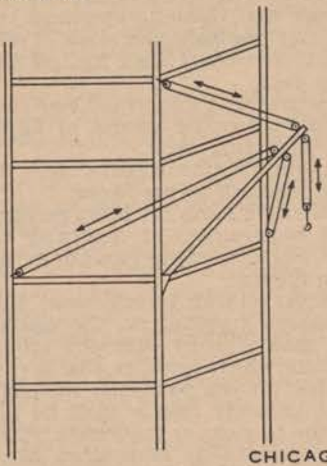
BASKET

(4) "Breast derrick" means a derrick without boom. The mast consists of two side members spread farther apart at the base than at the top and tied together at top and bottom by rigid members. The mast is prevented from tipping forward by guys connected to its top. The load is raised and lowered by ropes through a sheave or block secured to the top crosspiece.



BREAST

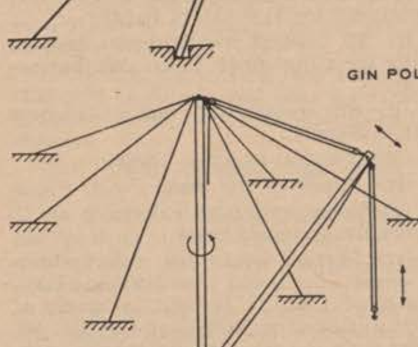
(5) "Chicago boom derrick" means a boom which is attached to a structure, an outside upright member of the structure serving as the mast, and the boom being stepped in a fixed socket clamped to the upright. The derrick is complete with load, boom, and boom point swing line falls.



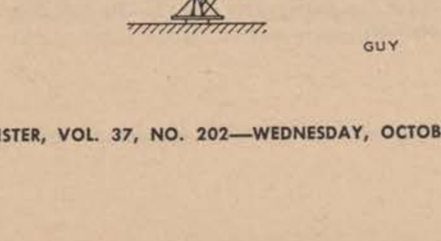
CHICAGO BOOM

(6) A "gin pole derrick" is a derrick without a boom. Its guys are so arranged from its top as to permit leaning the mast in any direction. The load is raised and lowered by ropes reeved through sheaves or blocks at the top of the mast.

(7) "Guy derrick" means a fixed derrick consisting of a mast capable of being rotated, supported in a vertical position by guys, and a boom whose bottom end is hinged or pivoted to move in a vertical plane with a reeved rope between the head of the mast and the boom point for raising and lowering the boom, and a reeved rope from the boom point for raising and lowering the load.



GIN POLE



GUY

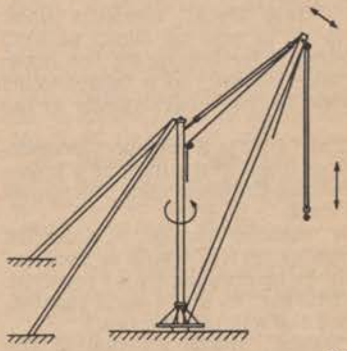
(8) "Shearleg derrick" means a derrick without a boom and similar to a breast derrick. The mast, wide at the bottom and narrow at the top, is hinged at the bottom and has its top secured by a multiple reeved guy to permit handling loads at various radii by means of load tackle suspended from the mast top.

(9) A "stiffleg derrick" is a derrick similar to a guy derrick except that the mast is supported or held in place by two or more stiff members, called stifflegs, which are capable of resisting either tensile or compressive forces. Sills are generally provided to connect the lower ends of the stifflegs to the foot of the mast.

(10) "Appointed" means assigned specific responsibilities by the employer or the employer's representative.

(11) "ANSI" means the American National Standards Institute.

(12) A boom is a timber or metal section or strut, pivoted or hinged at the heel (lower end) at a location fixed in height on a frame or mast or vertical member, and with its point (upper end) supported by chains, ropes, or rods to the upper end of the frame, mast, or vertical member. A rope for raising and lowering the load is reeved through sheaves or a block at the boom point. The length of the boom shall be taken as the straight line distance between the axis of the foot pin and the axis of the boom point sheave pin, or where used, the axis of the upper load block attachment pin.



STIFF LEG

(13) "Boom harness" means the block and sheave arrangement on the boom point to which the topping lift cable is reeved for lowering and raising the boom.

(14) The "boom point" is the outward end of the top section of the boom.

(15) "Derrick bullwheel" means a horizontal ring or wheel, fastened to the foot of a derrick, for the purpose of turning the derrick by means of ropes leading from this wheel to a powered drum.

(16) "Designated" means selected or assigned by the employer or employer's representative as being qualified to perform specific duties.

(17) "Eye" means a loop formed at the end of a rope by securing the dead end to the live end at the base of the loop.

(18) A "fiddle block" is a block consisting of two sheaves in the same plane held in place by the same cheek plates.

(19) The "foot bearing" or "foot block" (sill block) is the lower support on which the mast rotates.

(20) A "gudgeon pin" is a pin connecting the mast cap to the mast allowing rotation of the mast.

(21) A "guy" is a rope used to steady or secure the mast or other member in the desired position.

(22) "Load, working" means the external load, in pounds, applied to the derrick, including the weight of load attaching equipment such as load blocks, shackles, and slings.

(23) "Load block, lower" means the assembly of sheaves, pins, and frame suspended by the hoisting rope.

(24) "Load block, upper" means the assembly of sheaves, pins, and frame suspended from the boom.

(25) "Mast" means the upright member of the derrick.

(26) "Mast cap (spider)" means the fitting at the top of the mast to which the guys are connected.

(27) "Reeving" means a rope system in which the rope travels around drums and sheaves.

(28) "Rope" refers to wire rope unless otherwise specified.

(29) "Safety Hook" means a hook with a latch to prevent slings or load from accidentally slipping off the hook.

(30) "Side loading" is a load applied at an angle to the vertical plane of the boom.

(31) The "sill" is a member connecting the foot block and stiffleg or a member connecting the lower ends of a double member mast.

(32) A "standby derrick" is a derrick not in regular service which is used occasionally or intermittently as required.

(33) "Stiffleg" means a rigid member supporting the mast at the head.

(34) "Swing" means rotation of the mast and/or boom for movements of loads in a horizontal direction about the axis of rotation.

(b) *General requirements*—(1) *Application.* This section applies to guy, stiffleg, basket, breast, gin pole, Chicago boom and A-frame derricks of the stationary type, capable of handling loads at variable reaches and powered by hoists through systems of rope reeving, used to perform lifting hook work, single or multiple line bucket work, grab, grapple, and magnet work. Derricks may be permanently installed for temporary use as in construction work. The requirements of this section also apply to any modification of these types which retain their fundamental features, except for floating derricks.

(2) *New and existing equipment.* All new derricks constructed and installed on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Derricks, ANSI B30.6–1969. Derricks constructed prior to August 31, 1971, should be modified to conform to those design specifications by February 15, 1972, unless it can be shown that the derrick cannot feasibly or economically be altered and that the derrick substantially complies with the requirements of this section.

(c) *Load ratings*—(1) *Rated load marking.* For permanently installed derricks with fixed lengths of boom, guy, and mast, a substantial, durable, and clearly legible rating chart shall be provided with each derrick and securely affixed where it is visible to personnel responsible for the safe operation of the equipment. The chart shall include the following data:

(i) Manufacturer's approved load ratings at corresponding ranges of boom angle or operating radii.

(ii) Specific lengths of components on which the load ratings are based.

(iii) Required parts for hoist reeving. Size and construction of rope may be shown either on the rating chart or in the operating manual.

(2) *Nonpermanent installations.* For nonpermanent installations, the manufacturer shall provide sufficient information from which capacity charts can be prepared for the particular installation. The capacity charts shall be located at the derricks or the jobsite office.

(d) *Inspection*—(1) *Inspection classification.* (i) Prior to initial use all new and altered derricks shall be inspected to insure compliance with the provisions of this section.

(ii) Inspection procedure for derricks in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the derrick and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as frequent and periodic with respective intervals between inspections as defined below:

(*a*) Frequent inspection—Daily to monthly intervals.

(*b*) Periodic inspection—1- to 12-month intervals, or as specified by the manufacturer.

(2) *Frequent inspection.* Items such as the following shall be inspected for defects at intervals as defined in subparagraph (1) (ii) (*a*) of this paragraph or as specifically indicated, including observation during operation for any defects which might appear between regular inspections. Deficiencies shall be carefully examined for any safety hazard:

(i) All control mechanisms: Inspect daily for adjustment, wear, and lubrication.

(ii) All chords and lacing: Inspect daily, visually.

(iii) Tension in guys: Daily.

(iv) Plumb of the mast.

(v) Deterioration or leakage in air or hydraulic systems: Daily.

(vi) Derrick hooks for deformations or cracks; for hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook, refer to paragraph (e) (3) (iii) of this section.

(vii) Rope reeving; visual inspection for noncompliance with derrick manufacturer's recommendations.

(viii) Hoist brakes, clutches, and operating levers: check daily for proper functioning before beginning operations.

(ix) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

(3) *Periodic inspection.* (i) Complete inspections of the derrick shall be performed at intervals as generally defined in subparagraph (1) (ii) (*b*) of this paragraph depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of subparagraph (2) of this paragraph and in addition, items such as the following. Deficiencies shall be carefully examined and a determination made as to whether they constitute a safety hazard:

(*a*) Structural members for deformations, cracks, and corrosion.

(*b*) Bolts or rivets for tightness.

(*c*) Parts such as pins, bearings, shafts, gears, sheaves, drums, rollers, locking and clamping devices, for wear, cracks, and distortion.

(*d*) Gudgeon pin for cracks, wear, and distortion each time the derrick is to be erected.

(*e*) Powerplants for proper performance and compliance with applicable safety requirements.

(*f*) Hooks: should be magnetic particle or other suitable crack detecting inspection should be performed at least once each year.

(ii) Foundation or supports shall be inspected for continued ability to sustain the imposed loads.

(4) *Derricks not in regular use.* (i) A derrick which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming with requirements of subparagraph (2) of this paragraph and paragraph (g) (3) of this section before placing in service.

(ii) A derrick which has been idle for a period of over 6 months shall be given a complete inspection conforming with requirements of subparagraphs (2) and (3) of this paragraph and paragraph (g) (3) of this section before placing in service.

(iii) Standby derricks shall be inspected at least semiannually in accordance with requirements of subparagraph (2) of this paragraph and paragraph (g) (3) of this section. Those exposed to adverse environment should be inspected more frequently.

(e) *Testing*—(1) *Operational tests.* Prior to initial use all new and altered derricks shall be tested to insure compliance with this section including the following functions:

(i) Load hoisting and lowering.

(ii) Boom up and down.

(iii) Swing.

(iv) Operation of clutches and brakes of hoist.

(2) *Anchorages.* All anchorages shall be approved by the appointed person.

Rock and hairpin anchorages may require special testing.

(f) *Maintenance*—(1) *Preventive maintenance.* A preventive maintenance program based on the derrick manufacturer's recommendations shall be established.

(2) *Maintenance procedure.* (i) Before adjustments and repairs are started on a derrick the following precautions shall be taken:

(*a*) The derrick to be repaired shall be arranged so it will cause the least interference with other equipment and operations in the area.

(*b*) All hoist drum dogs shall be engaged.

(*c*) The main or emergency switch shall be locked in the open position, if an electric hoist is used.

(*d*) Warning or out of order signs shall be placed on the derrick and hoist.

(*e*) The repairs of booms of derricks shall either be made when the booms are lowered and adequately supported or safely tied off.

(*f*) A good communication system shall be set up between the hoist operator and the appointed individual in charge of derrick operations before any work on the equipment is started.

(*g*) Welding repairs shall be approved by an appointed person.

(ii) After adjustments and repairs have been made the derrick shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.

(3) *Adjustments and repairs.* (i) Any unsafe conditions disclosed by inspection shall be corrected before operation of the derrick is resumed.

(ii) Adjustments shall be maintained to assure correct functioning of components.

(iii) Repairs or replacements shall be provided promptly as needed for safe operation. The following are examples of conditions requiring prompt repair or replacement:

(*a*) Hooks showing defects described in paragraph (d)(2)(vi) of this section shall be discarded.

(*b*) All critical parts which are cracked, broken, bent, or excessively worn.

(*c*) Pitted or burned electrical contacts should be corrected only by replacement and in sets. Controller parts should be lubricated as recommended by the manufacturer.

(*d*) All replacement and repaired parts shall have at least the original safety factor.

(g) *Rope inspection*—(1) *Running ropes.* A thorough inspection of all ropes in use shall be made at least once a month and a full written, dated, and signed report of rope condition kept on file where readily available. Any deterioration, resulting in appreciable loss of original strength, such as described below, shall be carefully noted and determination made as to whether further use of the rope would constitute a safety hazard:

(i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.

(ii) A number of broken outside wires and the degree of distribution or concentration of such broken wires.

(iii) Worn outside wires.

(iv) Corroded or broken wires at end connections.

(v) Corroded, cracked, bent, worn, or improperly applied end connections.

(vi) Severe kinking, crushing, cutting, or unstranding.

(2) *Limited travel ropes.* Heavy wear and/or broken wires may occur in sections in contact with equalizer sheaves or other sheaves where rope travel is limited, or with saddles. Particular care shall be taken to inspect ropes at these locations.

(3) *Idle ropes.* All rope which has been idle for a period of a month or more due to shutdown or storage of a derrick on which it is installed shall be given a thorough inspection before it is placed in service. This inspection shall be for all types of deterioration. A written and dated report of the rope condition shall be available.

(4) *Nonrotating ropes.* Particular care shall be taken in the inspection of nonrotating rope.

(h) *Operations of derricks.* Derrick operations shall be directed only by the individual specifically designated for that purpose.

(i) *Handling the load*—(1) *Size of load.* (i) No derrick shall be loaded beyond the rated load.

(ii) When loads approach the maximum rating of the derrick, it shall be ascertained that the weight of the load has been determined within plus or minus 10 percent before it is lifted.

(2) *Attaching the load.* (i) The hoist rope shall not be wrapped around the load.

(ii) The load shall be attached to the hook by means of slings or other suitable devices.

(3) *Moving the load.* (i) The load shall be well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.

(ii) Before starting to hoist, the following conditions shall be noted:

(*a*) Hoist rope shall not be kinked.

(*b*) Multiple part lines shall not be twisted around each other.

(*c*) The hook shall be brought over the load in such a manner as to prevent swinging.

(*d*) If there is a slack rope condition, it should be determined that the rope is properly seated on the drum and in the sheaves.

(iii) During hoisting, care shall be taken that:

(*a*) There is no sudden acceleration or deceleration of the moving load.

(*b*) Load does not contact any obstructions.

(iv) A derrick shall not be used for side loading except when specifically authorized by a responsible person who has determined that the various structural components will not be overstressed.

(v) No hoisting, lowering, or swinging shall be done while anyone is on the load or hook.

(vi) The operator should avoid carrying loads over people.

(vii) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.

(viii) Neither the load nor boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.

(ix) When rotating a derrick, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled.

(x) Boom and hoisting rope systems shall not be twisted.

(4) *Holding the load.* (i) The operator shall not be allowed to leave his position at the controls while the load is suspended.

(ii) People should not be permitted to stand or pass under a load on the hook.

(iii) If the load must remain suspended for any considerable length of time, a dog, or pawl and ratchet, or other equivalent means, rather than the brake alone, shall be used to hold the load.

(5) *Use of winch heads.* (i) Ropes shall not be handled on a winch head without the knowledge of the operator.

(ii) While a winch head is being used, the operator shall be within convenient reach of the power unit control lever.

(6) *Securing boom.* Dogs, pawls, or other positive holding mechanism on the hoist shall be engaged. When not in use, the derrick boom shall:

(i) Be laid down;

(ii) Be secured to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block; or

(iii) Be hoisted to a vertical position and secured to the mast.

(j) *Other requirements*—(1) *Guards.* (i) Exposed moving parts, such as gears, ropes, setscrews, projecting keys, chains, chain sprockets, and reciprocating components, which constitute a hazard under normal operating conditions shall be guarded.

(ii) Guards shall be securely fastened.

(iii) Each guard shall be capable of supporting without permanent distortion, the weight of a 200-pound person unless the guard is located where it is impossible for a person to step on it.

(2) *Hooks.* (i) Hooks shall meet the manufacturer's recommendations and shall not be overloaded.

(ii) Safety latch type hooks shall be used wherever possible.

(3) *Fire extinguishers.* (i) A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the immediate vicinity of the derrick.

(ii) Operating and maintenance personnel shall be familiar with the use and care of the fire extinguishers provided.

(4) *Refueling.* (i) Refueling with portable containers shall be done with Underwriters' Laboratory, Inc. (UL), or Factory Mutual Laboratories approved, or equivalent, safety type containers

equipped with automatic closing spout and flame arrester.

(ii) Machines shall not be refueled with the engine running.

(5) *Operating near electric powerlines.* (i) Except where the electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers not a part of or an attachment to the derrick have been erected to prevent physical contact with the lines, derricks shall be operated proximate to, under, over, by, or near powerlines only in accordance with the following:

(*a*) For lines rated 50 kv. or below minimum clearance between the lines and any part of the derrick or load shall be 10 feet.

(*b*) For lines rated over 50 kv. minimum clearance between the lines and any part of the derrick or load shall be 10 feet plus 0.4 inch for each 1 kv. over 50 kv., or use twice the length of the line insulator, but never less than 10 feet.

(ii) Cage-type boom guards, insulating links, or proximity warning devices may be used on derricks, but the use of such devices shall not operate to alter the requirements of subdivision (i) of this subparagraph.

(iii) Before the commencement of operations near electrical lines, the owners of the lines or their authorized representatives shall be notified and provided with all pertinent information. The owner's cooperation shall be requested.

(iv) Any overhead wire shall be considered to be an energized line until the owner of the line or their authorized representatives state that it is deenergized.

(6) *Cab or operating enclosure.* (i) Necessary clothing and personnel belongings shall be stored in such a manner as to not interfere with access or operation.

(ii) Tools, oilcans, waste, extra fuses, and other necessary articles shall be stored in the toolbox, and shall not be permitted to lie loose in or about the cab or operating enclosure.

§ 1910.182 Effective dates.

(a) The provisions of this Subpart N shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.177 (d) and (f).
§ 1910.178 (a) (2) and (3), (c), (e), and (m)(11).
§ 1910.179 (b)(6), (c), (d), (e), (f), (g), and (h).
§ 1910.180(c).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal Standard in this Subpart N which is derived from 41 CFR Part 50-204 shall also become effective and shall be applicable to such employment and place of employment, on the same date.

§ 1910.183 Sources of standards.

Sec.	*Source*
1910.176	41 CFR 50-204.3.
1910.177	NFPA No. 231-1970, General Indoor Storage.
1910.178(a) (1)	NFPA No. 505-1969, Powered Industrial Trucks.
1910.178(a) (2)	ANSI B56.1-1969, Standard for Powered Industrial Trucks, Part II.
1910.178(a) (3)	NFPA No. 505-1969, Powered Industrial Trucks.
1910.178(a) (4)-(7)	ANSI B56.1-1969, Standard for Powered Industrial Trucks.
1910.178 (b)-(d)	NFPA No. 505-1969, Powered Industrial Trucks.
1910.178 (e)-(p)	ANSI B56.1-1969, Powered Industrial Trucks.
1910.178(q)	NFPA No. 505-1969, Powered Industrial Trucks.
1910.179	ANSI B30.2.0-1967, Safety Code for Overhead and Gantry Cranes.
1910.180	ANSI B30.5-1968, Safety Code for Crawler, Locomotive, and Truck Cranes.
1910.181	ANSI B30.6-1969, Safety Code for Derricks.

§ 1910.184 Standards organizations.

Specific standards of the following organizations have been referenced in this part. Copies of the referenced materials may be obtained from the issuing organizations.

American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc., 345 East 47th Street, New York, NY 10017.
Crane Manufacturers Association of America, Inc., 1 Thomas Circle NW., Washington, DC 20005.
American National Standards Institute, 1430 Broadway, New York, NY 10018.
National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.
Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York, NY 10017.

Subpart O—Machinery and Machine Guarding

§ 1910.211 Definitions.

(a) As used in §§ 1910.213 and 1910.214 unless the context clearly requires otherwise, the following woodworking machinery terms shall have the meaning prescribed in this paragraph.

(1) "Point of operations" means that point at which cutting, shaping, boring, or forming is accomplished upon the stock.

(2) "Push stick" means a narrow strip of wood or other soft material with a notch cut into one end and which is used to push short pieces of material through saws.

(3) "Block" means a short block of wood, provided with a handle similar to that of a plane and a shoulder at the rear end, which is used for pushing short stock over revolving cutters.

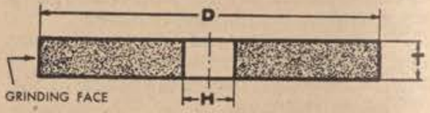
(b) As used in § 1910.215 unless the context clearly requires otherwise, the following abrasive wheel machinery terms shall have the meanings prescribed in this paragraph.

(1) "Type 1 straight wheels" means wheels having diameter, thickness, and hole size dimensions, and they should be used only on the periphery. Type 1 wheels shall be mounted between flanges.

LIMITATION: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other applications should not exceed one-half wheel diameter.

Figure No. 0-1

TYPE 1 STRAIGHT WHEELS



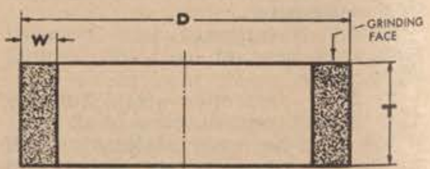
Type 1 — Straight Wheel.
Peripheral grinding wheel having a diameter, thickness and hole.

(2) "Type 2 cylinder wheels" means wheels having diameter, wheel thickness, and rim thickness dimensions. Grinding is performed on the rim face only, dimension W. Cylinder wheels may be plain, plate mounted, inserted nut, or of the projecting stud type.

LIMITATION: Rim height, T dimension, is generally equal to or greater than rim thickness, W dimension.

Figure No. 0-2

TYPE 2 CYLINDER WHEELS



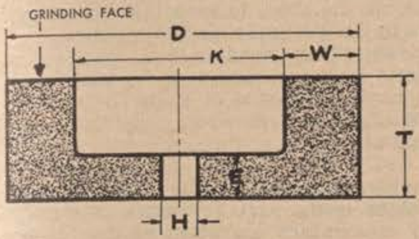
Type 2 — Cylinder Wheel
Side grinding wheel having a diameter, thickness and wall—wheel is mounted on the diameter.

(3) "Type 6 straight cup wheels" means wheels having diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on rim face, W dimension.

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, must be large enough to accommodate a suitable flange.

Figure No. 0-3

TYPE 6 STRAIGHT CUP WHEELS



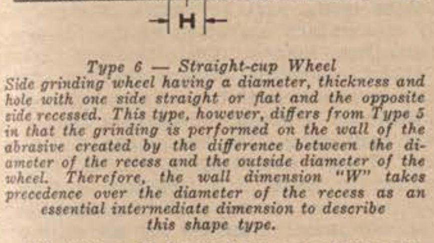
Type 6 — Straight-cup Wheel
Side grinding wheel having a diameter, thickness and hole with one side straight or flat and the opposite side recessed. This type, however, differs from Type 5 in that the grinding is performed on the wall of the abrasive created by the difference between the diameter of the recess and the outside diameter of the wheel. Therefore, the wall dimension "W" takes precedence over the diameter of the recess as an essential intermediate dimension to describe this shape type.

(4) "Type 11 flaring cup wheels" mean wheels having double diameter dimensions D and J, and in addition have thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face, W dimension. Type 11 wheels are subject to all limitations of use and mounting listed for type 6 straight sided cup wheels definition.

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition when unthreaded hole wheels are specified the inside flat, K dimension, shall be large enough to accommodate a suitable flange.

Figure No. 0-4

TYPE 11 FLARING CUP WHEELS

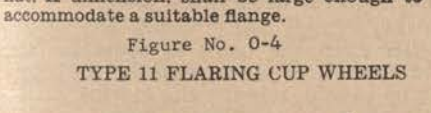


Type 11 — Flaring-cup Wheel
Side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at the grinding face (W).

(5) "Modified types 6 and 11 wheels (terrazzo)" mean some type 6 and 11 cup wheels used in the terrazzo trade having tapered K dimensions to match a special tapered flange furnished by the machine builder.

LIMITATION: These wheels shall be mounted only with a special tapered flange.

Figure No. 0-5
Type 6& 11 Wheels (Terrazzo)



Typical examples of modified types 6 and 11 wheels (terrazzo) showing tapered K dimensions.

(6) "Types 27 and 28 depressed center wheels" mean wheels having diameter, thickness, and hole size dimensions. Both types are reinforced, organic bonded wheels having offset hubs which permit side and peripheral grinding operations without interference with the mounting. Type 27 wheels are manufactured with flat grinding rims permitting notching and cutting operations. Type 28 wheels have saucer shaped grinding rims.

(i) Limitations: Special supporting, back adapter and inside flange nuts are required for the proper mounting of these types of wheels subject to limitations of § 1910.215(c)(4) (i) and (ii).

(ii) Mounts which are affixed to the wheel by the manufacturer may not require an inside nut and shall not be reused.

(7) "Type 27A depressed center, cutting-off wheels" mean wheels having diameter, thickness, and hole size dimensions. They are reinforced, organic bonded, offset hub type wheels, usually 16 inches diameter and larger, specially designed for use on cutting-off machines where mounting nut or outer flange interference cannot be tolerated.

LIMITATIONS: See § 1910.215(c)(1).

(8) "Surface feet per minute" (s.f.p.m.) means the distance in feet any one abrasive grain on the peripheral surface of a grinding wheel travels in 1 minute.

$$\text{Surface Feet Per Minute} = \frac{3.1416 \times \text{diameter in inches} \times \text{r.p.m.}}{12}$$

or

$$.262 \times \text{diameter in inches} \times \text{r.p.m.}$$

Examples: (a) 24-inch diameter wheel, 1,000 revolutions per minute. Surface Feet per minute .262×24×1,000=6,288 s.f.p.m.

(b) 12-inch diameter wheel, 1,000 revolutions per minute. Surface Feet per minute .262×12×1,000=3,144 s.f.p.m.

(9) "Flanges" means collars, discs or plates between which wheels are mounted and are referred to as adaptor, sleeve, or back up type. See paragraph (c) of § 1910.215 for full description.

(10) "Snagging" means grinding which removes relatively large amounts of material without regard to close tolerances or surface finish requirements.

(11) "Off-hand grinding" means the grinding of any material or part which is held in the operator's hand.

(12) "Safety guard" means an enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation. See paragraph (b) of § 1910.215.

(13) "Cutting off wheels" mean wheels having diameter thickness and hole size dimensions and are subject to all limitations of mounting and use listed for type 1 wheels, the definition in subparagraph (1) of this paragraph and paragraph (d) of § 1910.215. They may be steel centered, diamond abrasive or organic bonded abrasive of the plain or reinforced type.

(i) Limitation: Cutting off wheels are recommended only for use on specially designed and fully guarded machines and are subject to the following maximum thickness and hole size limitations.

Wheel diameter:	*Max. thickness (inch)*
6 inch and smaller	3/16
Larger than 6 inches to 12 inches	1/4
Larger than 12 inches to 23 inches	3/8
Larger than 23 inches	1/2

(ii) Maximum hole size for cutting-off wheels should not be larger than 1/4-wheel diameter.

(14) "Abrasive wheel" means a cutting tool consisting of abrasive grains held together by organic or inorganic bonds. Diamond and reinforced wheels are included.

(15) "Organic wheels" means wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

(16) "Inorganic wheels" means wheels which are bonded by means of inorganic material such as clay, glass, porcelain, sodium silicate, magnesium oxychloride, or metal. Wheels bonded with clay, glass, porcelain or related ceramic materials are characterized as "vitrified bonded wheels."

(c) As used in 1910.216, unless the context clearly requires otherwise, the following mills and calendars in the rubber and plastic industries terms shall have the meanings prescribed in this paragraph.

(1) "Bite" means the nip point between any two inrunning rolls.

(2) "Calender" means a machine equipped with two or more metal rolls revolving in opposite directions and used for continuously sheeting or plying up rubber and plastics compounds and for frictioning or coating materials with rubber and plastics compounds.

(3) "Mill" means a machine consisting of two adjacent metal rolls, set horizontally, which revolve in opposite directions (i.e., toward each other as viewed from above) used for the mechanical working of rubber and plastics compounds.

(d) As used in § 1910.217, unless the context clearly requires otherwise, the following power press terms shall have the meaning prescribed in this paragraph.

(1) "Antirepeat" means the part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is held operated. Antirepeat requires release of all tripping mechanisms before another stroke can be initiated. "Antirepeat" is also called single stroke reset or reset circuit.

(2) "Brake" means the mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

(3) "Bolster plate" means the plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

(4) "Clutch" means the coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

(5) "Full revolution clutch" means a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

(6) "Part revolution clutch" means a type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

(7) "Direct drive" means the type of driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energization and deenergization of a motor. Even though not employing a clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.

(8) "Concurrent" means acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

(9) "Continuous" means uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

(10) "Counterbalance" means the mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

(11) "Device" means a press control or attachment that:

(i) Restrains the operator from inadvertently reaching into the point of operation, or

(ii) Prevents normal press operation if the operator's hands are inadvertently within the point of operation, or

(iii) Automatically withdraws the operator's hands if the operator's hands are inadvertently within the point of operation as the dies close.

(12) "Presence sensing device" means a device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control of the press when an operator's hand or any other parts of his body is within such field or area.

(13) "Gate or movable barrier device" means a movable barrier arranged to enclose the point of operation before the press stroke can be started.

(14) "Holdout or restraint device" means a mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

(15) "Pull-out device" means a mechanism attached to the operator's hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator's hands as the dies close, if the operator's hands are inadvertently within the point of operation.

(16) "Sweep device" means a single or double arm (rod) attached to the upper die or slide of the press and designed to move the operator's hands to a safe position as the dies close, if the operator's hands are inadvertently within the point of operation.

(17) "Two hand control device" means a two hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

(18) "Die" means the tooling used in a press for cutting or forming material. An upper and a lower die make a complete set.

(19) "Die builder" means any person who builds dies for power presses.

(20) "Die set" means a tool holder held in alignment by guide posts and bushings and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushings.

(21) "Die setter" means an individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

(22) "Die setting" means the process of placing or removing dies in or from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

(23) "Die shoe" means a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and, when used, is bolted or clamped to the bolster plate or the face of slide.

(24) "Ejector" means a mechanism for removing work or material from between the dies.

(25) "Face of slide" means the bottom surface of the slide to which the punch or upper die is generally attached.

(26) "Feeding" means the process of placing or removing material within or from the point of operation.

(27) "Automatic feeding" means feeding wherein the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

(28) "Semiautomatic feeding" means feeding wherein the material or part being processed is placed within or removed from the point of operation by an auxiliary means controlled by operator on each stroke of the press.

(29) "Manual feeding" means feeding wherein the material or part being processed is handled by the operator on each stroke of the press.

(30) "Foot control" means the foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

(31) "Foot pedal" means the foot operated lever designed to operate the mechanical linkage that trips a full revolution clutch.

(32) "Guard" means a barrier that prevents entry of the operator's hands or fingers into the point of operation.

(33) "Die enclosure guard" means an enclosure attached to the die shoe or stripper, or both, in a fixed position.

(34) "Fixed barrier guard" means a die space barrier attached to the press frame.

(35) "Interlocked press barrier guard" means a barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

(36) "Adjustable barrier guard" means a barrier requiring adjustment for each job or die setup.

(37) "Guide post" means the pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies.

(38) "Hand feeding tool" means any hand held tool designed for placing or removing material or parts to be processed within or from the point of operation.

(39) "Inch" means an intermittent motion imparted to the slide (on machines using part revolution clutches) by momentary operation of the "Inch" operating means. Operation of the "Inch" operating means engages the driving clutch so that a small portion of one stroke or indefinite stroking can occur, depending upon the length of time the "Inch" operating means is held operated. "Inch" is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator.

(40) "Jog" means an intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

(41) "Knockout" means a mechanism for releasing material from either die.

(42) "Liftout" means the mechanism also known as knockout.

(43) "Operator's station" means the complete complement of controls used by or available to an operator on a given operation for stroking the press.

(44) "Pinch point" means any point other than the point of operation at which it is possible for a part of the body to be caught between the moving parts of a press or auxiliary equipment, or between moving and stationary parts of a press or auxiliary equipment or between the material and moving part or parts of the press or auxiliary equipment.

(45) "Point of operation" means the area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

(46) "Press" means a mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping, or combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

(47) "Repeat" means an unintended or unexpected successive stroke of the press resulting from a malfunction.

(48) "Safety block" means a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight.

(49) "Single stroke" means one complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

(50) "Single stroke mechanism" means an arrangement used on a full revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.

(51) "Slide" means the main reciprocating press member. A slide is also called a ram, plunger, or platen.

(52) "Stop control" means an operator control designed to immediately deactivate the clutch control and activate the brake to stop slide motion.

(53) "Stripper" means a mechanism or die part for removing the parts or material from the punch.

(54) "Stroking selector" means the part of the clutch/brake control that determines the type of stroking when the operating means is actuated. The stroking selector generally includes positions for "Off" (Clutch Control), "Inch," "Single Stroke," and "Continuous" (when Continuous is furnished).

(55) "Trip or (tripping)" means activation of the clutch to "run" the press.

(56) "Turnover bar" means a bar used in die setting to manually turn the crankshaft of the press.

(57) "Two-hand trip" means a clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

(58) "Unitized tooling" means a type of die in which the upper and lower members are incorporated into a selfcontained unit so arranged as to hold the die members in alignment.

(e) As used in § 1910.218, unless the context clearly requires otherwise, the following forging and hot metal terms shall have the meaning prescribed in this paragraph.

(1) "Forging" means the product of work on metal formed to a desired shape by impact or pressure in hammers, forging machines (upsetters), presses, rolls, and related forming equipment. Forging hammers, counterblow equipment and high-energy-rate forging machines impart impact to the workpiece, while most other types of forging equipment impart squeeze pressure in shaping the stock. Some metals can be forged at room temperature, but the majority of metals are made more plastic for forging by heating.

(2) "Open framehammers (or blacksmith hammers)" mean hammers used primarily for the shaping of forgings by means of impact with flat dies. Open frame hammers generally are so constructed that the anvil assembly is separate from the operating mechanism and machine supports; it rests on its own independent foundation. Certain exceptions are forging hammers made with frame mounted on the anvil; e.g., the smaller, single-frame hammers are usually made with the anvil and frame in one piece.

(3) "Steam hammers" mean a type of drop hammer where the ram is raised for each stroke by a double-action steam cylinder and the energy delivered to the workpiece is supplied by the velocity and weight of the ram and attached upper die driven downward by steam pressure. Energy delivered during each stroke may be varied.

(4) "Gravity hammers" mean a class of forging hammer wherein energy for forging is obtained by the mass and velocity of a freely falling ram and the attached upper die. Examples: board hammers and air-lift hammers.

(5) "Forging presses" mean a class of forging equipment wherein the shaping of metal between dies is performed by mechanical or hydraulic pressure, and usually is accomplished with a single workstroke of the press for each die station.

(6) "Trimming presses" mean a class of auxiliary forging equipment which removes flash or excess metal from a forging. This trimming operation can also be done cold, as can coining, a product sizing operation.

(7) "High-energy-rate forging machines" mean a class of forging equipment wherein high ram velocities resulting from the sudden release of a compressed gas against a free piston impart impact to the workpiece.

(8) "Forging rolls" mean a class of auxiliary forging equipment wherein stock is shaped between power driven rolls bearing contoured dies. Usually used for preforming, roll forging is often employed to reduce thickness and increase length of stock.

(9) "Ring rolls" mean a class for forging equipment used for shaping weldless rings from pierced discs or thick-walled, ring-shaped blanks between rolls which control wall thickness, ring diameter, height and contour.

(10) "Bolt-headers" mean the same as an upsetter or forging machine except that the diameter of stock fed into the machine is much smaller, i.e., commonly three-fourths inch or less.

(11) Rivet making machines mean the same as upsetters and boltheaders when producing rivets with stock diameter of 1-inch or more. Rivet making with less than 1-inch diameter is usually a cold forging operation, and therefore not included in this subpart.

(12) Upsetters (or forging machines, or headers) type of forging equipment, related to the mechanical press, in which the main forming energy is applied horizontally to the workpiece which is gripped and held by prior action of the dies.

(f) As used in § 1910.219, unless, the context clearly requires otherwise, the following mechanical power-transmission guarding terms shall have the meaning prescribed in this paragraph.

(1) "Belts" include all power transmission belts, such as flat belts, round belts, V-belts, etc., unless otherwise specified.

(2) "Belt shifter" means a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

(3) "Belt pole" (sometimes called a "belt shipper" or "shipper pole,") means a device used in shifting belts on and off fixed pulleys on line or countershaft where there are no loose pulleys.

(4) "Exposed to contact" means that the location of an object is such that a person is likely to come into contact with it and be injured.

(5) "Flywheels" include flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft of engine or other shafting.

(6) "Maintenance runway" means any permanent runway or platform used for oiling, maintenance, running adjustment, or repair work, but not for passageway.

(7) "Nip-point belt and pulley guard" means a device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes.

(8) "Point of operation" means that point at which cutting, shaping, or forming is accomplished upon the stock and shall include such other points as may offer a hazard to the operator in inserting or manipulating the stock in the operation of the machine.

(9) "Prime movers" include steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

(10) "Sheaves" mean grooved pulleys, and shall be so classified unless used as flywheels.

§ 1910.212 General requirements for all machines.

(a) *Machine guarding*—(1) *Types of guarding*. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks. Examples of guarding methods are—barrier guards, two-hand tripping devices, electronic safety devices, etc.

(2) *General requirements for machine guards*. Guards shall be affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible. The guard shall be such that it does not offer an accident hazard in itself.

(3) *Point of operation guarding*. (i) Point of operation is the area on a machine where work is actually performed upon the material being processed.

(ii) The point of operation of machines whose operation exposes an employee to injury, shall be guarded. The guarding device shall be in conformity with any appropriate standards therefor, or, in the absence of applicable specific standards, shall be so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.

(iii) Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding required by this section, but can only be used to supplement protection provided.

(iv) The following are some of the machines which usually require point of operation guarding:

(*a*) Guillotine cutters.
(*b*) Shears.
(*c*) Alligator shears.
(*d*) Power presses.
(*e*) Milling machines.
(*f*) Power saws.
(*g*) Jointers.
(*h*) Portable power tools.
(*i*) Forming rolls and calenders.

(4) *Barrels, containers, and drums.* Revolving drums, barrels, and containers shall be guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.

(5) *Exposure of blades.* When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded. The guard shall have openings no larger than one half (½) inch.

(b) *Anchoring fixed machinery.* Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

§ 1910.213 Woodworking machinery requirements.

(a) *Machine construction general.* (1) Each machine shall be so constructed as to be free from sensible vibration when the largest size tool is mounted and run idle at full speed.

(2) Arbors and mandrels shall be constructed so as to have firm and secure bearing and be free from play.

(3) The use of wooden bandsaw wheels other than those of commercial manufacture is prohibited.

(4) Any automatic cutoff saw that strokes continuously without the operator being able to control each stroke shall not be used.

(5) Saw frames or tables shall be constructed with lugs cast on the frame or with an equivalent means to limit the size of the saw blade that can be mounted, so as to avoid overspeed caused by mounting a saw larger than intended.

(6) Circular saw fences shall be so constructed that they can be firmly secured to the table or table assembly without changing their alignment with the saw. For saws with tilting tables or tilting arbors the fence shall be so constructed that it will remain in a line parallel with the saw, regardless of the angle of the saw with the table.

(7) Circular saw gages shall be so constructed as to slide in grooves or tracks that are accurately machined, to insure exact alignment with the saw for all positions of the guide.

(8) Hinged saw tables shall be so constructed that the table can be firmly secured in any position and in true alignment with the saw.

(9) All belts, pulleys, gears, shafts, and moving parts shall be guarded in accordance with the specific requirements of § 1910.219.

(10) It is recommended that each power-driven woodworking machine be provided with a disconnect switch that can be locked in the off position.

(11) The frames and all exposed, noncurrent-carrying metal parts of portable electric woodworking machinery operated at more than 90 volts to ground shall be grounded and other portable motors driving electric tools which are held in the hand while being operated shall be grounded if they operate at more than 90 volts to ground. The ground shall be provided through use of a separate ground wire and polarized plug and receptacle.

(12) For all circular saws where conditions are such that there is a possibility of contact with the portion of the saw either beneath or behind the table, that portion of the saw shall be covered with an exhaust hood, or, if no exhaust system is required, with a guard that shall be so arranged as to prevent accidental contact with the saw.

(13) Revolving double arbor saws shall be fully guarded in accordance with all the requirements for circular crosscut saws or with all the requirements for circular ripsaws, according to the kind of saws mounted on the arbors.

(14) No saw, cutter head, or tool collar shall be placed or mounted on a machine arbor unless the tool has been accurately machined to size and shape to fit the arbor.

(15) Combs (featherboards) or suitable jigs shall be provided at the workplace for use when a standard guard cannot be used, as in dadoing, grooving, jointing, moulding, and rabbeting.

(b) *Machine controls and equipment.* (1) A mechanical or electrical power control shall be provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation.

(2) On machines driven by belts and shafting, a locking-type belt shifter or an equivalent positive device shall be used.

(3) On applications where injury to the operator might result if motors were to restart after power failures, provision shall be made to prevent machines from automatically restarting upon restoration of power.

(4) Power controls and operating controls should be located within easy reach of the operator while he is at his regular work location, making it unnecessary for him to reach over the cutter to make adjustments. This does not apply to constant pressure controls used only for setup purposes.

(5) On each machine operated by electric motors, positive means shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.

(6) Each operating treadle shall be protected against unexpected or accidental tripping.

(7) Feeder attachments shall have the feed rolls or other moving parts so covered or guarded as to protect the operator from hazardous points.

(c) *Hand-fed ripsaws.* (1) Each circular hand-fed ripsaw shall be guarded by a hood which shall completely enclose that portion of the saw above the table and that portion of the saw above the material being cut. The hood and mounting shall be arranged so that the hood will automatically adjust itself to the thickness of and remain in contact with the material being cut but it shall not offer any considerable resistance to insertion of material to saw or to passage of the material being sawed. The hood shall be made of adequate strength to resist blows and strains incidental to reasonable operation, adjusting, and handling, and shall be so designed as to protect the operator from flying splinters and broken saw teeth. It shall be made of material that is soft enough so that it will be unlikely to cause tooth breakage. The material should not shatter when broken, should be nonexplosive, and should be no more flammable than wood. The hood shall be so mounted as to insure that its operation will be positive, reliable, and in true alignment with the saw; and the mounting shall be adequate in strength to resist any reasonable side thrust or other force tending to throw it out of line.

(2) Each hand-fed circular ripsaw shall be furnished with a spreader to prevent material from squeezing the saw or being thrown back on the operator. The spreader shall be made of hard tempered steel, or its equivalent, and shall be thinner than the saw kerf. It shall be of sufficient width to provide adequate stiffness or rigidity to resist any reasonable side thrust or blow tending to bend or throw it out of position. The spreader shall be attached so that it will remain in true alignment with the saw even when either the saw or table is tilted, and should be placed so that there is not more than ½-inch space between the spreader and the back of the saw when the largest saw is mounted in the machine. The provision of a spreader in connection with grooving, dadoing, or rabbeting is not required. On the completion of such operations, the spreader shall be immediately replaced.

(3) Each hand-fed circular ripsaw shall be provided with nonkickback fingers or dogs so located as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator. They shall be designed to provide adequate holding power for all the thicknesses of materials being cut.

(d) *Hand-fed crosscut table saws.* (1) Each circular crosscut table saw shall be guarded by a hood which shall meet all the requirements of paragraph (c)(1) of this section for hoods for circular ripsaws.

(2) Each circular crosscut saw should also be provided with a spreader which should meet all the requirements of paragraph (c)(2) of this section.

(e) *Circular resaws.* (1) Each circular resaw shall be guarded by a hood or shield of metal above the saw. This hood or shield shall be so designed as to guard against danger from flying splinters or broken saw teeth.

(2) Each circular resaw (other than self-feed saws with a roller or wheel at back of the saw) shall be provided with a spreader fastened securely behind the saw. The spreader shall be slightly thinner than the saw kerf and slightly thicker than the saw disk.

(f) *Self-feed circular saws.* (1) Feed rolls and saws shall be protected by a hood or guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and the bottom of the guard shall come down to within three-eighths inch of the plane formed by the bottom or working surfaces of the feed rolls. This distance (three-eighths inch) may be increased to three-fourths inch, provided the lead edge of the hood is extended to be not less than 5½ inches in front of the nip point between the front roll and the work.

(2) Each self-feed circular ripsaw shall be provided with sectional nonkickback fingers for the full width of the feed rolls. They shall be located in front of the saw and so arranged as to be in continual contact with the wood being fed.

(g) *Swing cutoff saws.* The requirements of this paragraph are also applicable to sliding cutoff saws mounted above the table.

(1) Each swing cutoff saw shall be provided with a hood that will completely enclose the upper half of the saw, the arbor end, and the point of operation at all positions of the saw. The hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters and broken saw teeth. Its hood shall be so designed that it will automatically cover the lower portion of the blade, so that when the saw is returned to the back of the table the hood will rise on top of the fence, and when the saw is moved forward the hood will drop on top of and remain in contact with the table or material being cut.

(2) Each swing cutoff saw shall be provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel. Such a device shall not depend for its proper functioning upon any rope, cord, or spring. If there is a counterweight, the bolts supporting the bar and counterweight shall be provided with cotter pins; and the counterweight shall be prevented from dropping by either a bolt passing through both the bar and counterweight, or a bolt put through the extreme end of the bar, or, where the counterweight does not encircle the bar, a safety chain attached to it.

(3) Limit chains or other equally effective devices shall be provided to prevent the saw from swinging beyond the front or back edges of the table, or beyond a forward position where the gullets of the lowest saw teeth will rise above the table top.

(4) Inverted swing cutoff saws shall be provided with a hood that will cover the part of the saw that protrudes above the top of the table or above the material being cut. It shall automatically adjust itself to the thickness of and remain in contact with the material being cut.

(h) *Radial saws.* (1) The upper hood shall completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor. The upper hood shall be constructed in such a manner and of such material that it will protect the operator from flying splinters, broken saw teeth, etc., and will deflect sawdust away from the operator. The sides of the lower exposed portion of the blade shall be guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with stock being cut to give maximum protection possible for the operation being performed.

(2) Each radial saw used for ripping shall be provided with nonkickback fingers or dogs located on both sides of the saw so as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator. They shall be designed to provide adequate holding power for all the thicknesses of material being cut.

(3) An adjustable stop shall be provided to prevent the forward travel of the blade beyond the position necessary to complete the cut in repetitive operations.

(4) Installation shall be in such a manner that the front end of the unit will be slightly higher than the rear, so as to cause the cutting head to return gently to the starting position when released by the operator.

(5) Ripping and ploughing shall be against the direction in which the saw turns. The direction of the saw rotation shall be conspicuously marked on the hood. In addition, a permanent label not less than 1½ inches by ¾ inch shall be affixed to the rear of the guard at approximately the level of the arbor, reading as follows: "Danger: Do Not Rip or Plough From This End". Such a label should be colored standard danger red.

(i) *Bandsaws and band resaws.* (1) All portions of the saw blade shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. Bandsaw wheels shall be fully encased. The outside periphery of the enclosure shall be solid. The front and back of the band wheels shall be either enclosed by solid material or by wire mesh or perforated metal. Such mesh or perforated metal shall be not less than 0.037 inch (U.S. Gage No. 20), and the openings shall be not greater than three-eighths inch. Solid material used for this purpose shall be of an equivalent strength and firmness. The guard for the portion of the blade between the sliding guide and the upper-saw-wheel guard shall protect the saw blade at the front and outer side. This portion of the guard shall be self-adjusting to raise and lower with the guide. The upper-wheel guard shall be made to conform to the travel of the saw on the wheel, and the top member of the guard should have at least a 2-inch clearance outside the saw and be lined with smooth material, preferably metal. Effective brakes should be provided to stop the wheel in case of blade breakage.

(2) Each bandsaw machine shall be provided with a tension control device to indicate a proper tension for the standard saws used on the machine, in order to assist in the elimination of saw breakage due to improper tension.

(3) Feed rolls of band resaws shall be protected with a suitable guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and the edge of the guard shall come to within three-eighths inch of the plane formed by the inside face of the feed roll in contact with the stock being cut.

(j) *Jointers.* (1) Each hand-fed planer and jointer with horizontal head shall be equipped with a cylindrical cutting head, the knife projection of which shall not exceed one-eighth inch beyond the cylindrical body of the head.

(2) The opening in the table shall be kept as small as possible. The clearance between the edge of the rear table and the cutter head shall be not more than one-eighth inch. The table throat opening shall be not more than 2½ inches when tables are set or aligned with each other for zero cut.

(3) Each hand-fed jointer with a horizontal cutting head shall have an automatic guard which will cover all the section of the head on the working side of the fence or gage. The guard shall effectively keep the operator's hand from coming in contact with the revolving knives. The guard shall automatically adjust itself to cover the unused portion of the head and shall remain in contact with the material at all times.

(4) Each hand-fed jointer with horizontal cutting head shall have a guard which will cover the section of the head back of the gage or fence.

(5) Each wood jointer with vertical head shall have either an exhaust hood or other guard so arranged as to enclose completely the revolving head, except for a slot of such width as may be necessary and convenient for the application of the material to be jointed.

(k) *Tenoning machines.* (1) Feed chains and sprockets of all double end tenoning machines shall be completely enclosed, except for that portion of chain used for conveying the stock.

(2) At the rear ends of frames over which feed conveyors run, sprockets and chains shall be guarded at the sides by plates projecting beyond the periphery of sprockets and the ends of lugs.

(3) Each tenoning machine shall have all cutting heads, and saws if used, covered by metal guards. These guards shall cover at least the unused part of the periphery of the cutting head. If such a guard is constructed of sheet metal, the material used shall be not less than one-sixteenth inch in thickness, and if cast iron is used, it shall be not less than three-sixteenths inch in thickness.

(4) Where an exhaust system is used, the guard shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than that specified in subparagraph (3) of this paragraph.

(l) *Boring and mortising machines.* (1) Safety-bit chucks with no projecting set screws shall be used.

(2) Boring bits should be provided with a guard that will enclose all portions of the bit and chuck above the material being worked.

(3) The top of the cutting chain and driving mechanism shall be enclosed.

(4) If there is a counterweight, one of the following or equivalent means shall be used to prevent its dropping:

(i) It shall be bolted to the bar by means of a bolt passing through both bar and counterweight;

(ii) A bolt shall be put through the extreme end of the bar;

(iii) Where the counterweight does not encircle the bar, a safety chain shall be attached to it;

(iv) Other types of counterweights shall be suspended by chain or wire rope and shall travel in a pipe or other suitable enclosure wherever they might fall and cause injury.

(5) Universal joints on spindles of boring machines shall be completely enclosed in such a way as to prevent accidental contact by the operator.

(6) Each operating treadle shall be covered by an inverted U-shaped metal guard, fastened to the floor, and of adequate size to prevent accidental tripping.

(m) *Wood shapers and similar equipment.* (1) The cutting heads of each wood shaper, hand-fed panel raiser, or other similar machine not automatically fed, shall be enclosed with a cage or adjustable guard so designed as to keep the operator's hand away from the cutting edge. The diameter of circular shaper guards shall be not less than the greatest diameter of the cutter. In no case shall a warning device of leather or other material attached to the spindle be acceptable.

(2) Cylindrical heads should be used whenever the nature of the work will permit. Single cutter knives in shaper heads shall not be used unless properly balanced.

(3) All double-spindle shapers shall be provided with a spindle starting and stopping device for each spindle.

(n) *Planing, molding, sticking, and matching machines.* (1) Each planing, molding, sticking, and matching machine shall have all cutting heads, and saws if used, covered by a metal guard. If such guard is constructed of sheet metal, the material used shall be not less than 1/16 inch in thickness, and if cast iron is used, it shall be not less than three-sixteenths inch in thickness.

(2) Where an exhaust system is used, the guards shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than that specified in subparagraph (1) of this paragraph.

(3) Feed rolls shall be guarded by a hood or suitable guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be fastened to the frame carrying the rolls so as to remain in adjustment for any thickness of stock.

(4) Surfacers or planers used in thicknessing multiple pieces of material simultaneously shall be provided with sectional infeed rolls having sufficient yield in the construction of the sections to provide feeding contact pressure on the stock, over the permissible range of variation in stock thickness specified or for which the machine is designed. In lieu of such yielding sectional rolls, suitable section kickback finger devices shall be provided at the infeed end.

(o) *Profile and swing-head lathes and wood heel turning machine.* (1) Each profile and swing-head lathe shall have all cutting heads covered by a metal guard. If such a guard is constructed of sheet metal, the material used shall be not less than one-sixteenth inch in thickness; and if cast iron is used, it shall not be less than three-sixteenths inch in thickness.

(2) Cutting heads on wood-turning lathes, whether rotating or not, shall be covered as completely as possible by hoods or shields, which should be hinged to the machines so that they can be thrown back for making adjustments.

(3) Shoe last and spoke lathes, doweling machines, wood heel turning machines, and other automatic wood-turning lathes of the rotating knife type shall be equipped with hoods enclosing the cutter blades completely except at the contact points while the stock is being cut.

(4) Lathes used for turning long pieces of wood stock held only between the two centers shall be equipped with long curved guards extending over the tops of the lathes in order to prevent the work pieces from being thrown out of the machines if they should become loose.

(5) Where an exhaust system is used, the guard shall form part or all of the exhaust hood and shall be constructed of metal of a thickness not less than that specified in subparagraph (1) of this paragraph.

(p) *Sanding machines.* (1) Feed rolls of self-feed sanding machines shall be protected with a semicylindrical guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point. The guard shall be constructed of heavy material, preferably metal, and firmly secured to the frame carrying the rolls so as to remain in adjustment for any thickness of stock. The bottom of the guard should come down to within three-eighths inch of a plane formed by the bottom or contact face of the feed roll where it touches the stock.

(2) Each drum sanding machine shall have an exhaust hood, or other guard if no exhaust system is required, so arranged as to enclose the revolving drum, except for that portion of the drum above the table, if a table is used, which may be necessary and convenient for the application of the material to be finished.

(3) Each disk sanding machine shall have the exhaust hood, or other guard if no exhaust system is required, so arranged as to enclose the revolving disk, except for that portion of the disk above the table, if a table is used, which may be necessary for the application of the material to be finished.

(4) Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs on to a pulley. These guards shall effectively prevent the hands or fingers of the operator from coming in contract with the nip points. The unused run of the sanding belt shall be guarded against accidental contact.

(q) *Veneer cutters and wringers.* (1) Veneer slicer knives shall be guarded to prevent accidental contact with knife edge, at both front and rear.

(2) Veneer clippers shall have automatic feed or shall be provided with a guard which will make it impossible to place a finger or fingers under the knife while feeding or removing the stock.

(3) Sprockets on chain or slat-belt conveyors shall be enclosed.

(4) Where practicable, hand and foot-power guillotine veneer cutters shall be provided with rods or plates or other satisfactory means, so arranged on the feeding side that the hands cannot reach the cutting edge of the knife while feeding or holding the stock in place.

(5) Power-driven guillotine veneer cutters, except continuous feed trimmers, shall be equipped with:

(i) Starting devices which require the simultaneous action of both hands to start the cutting motion and of at least one hand on a control during the complete stroke of the knife; or

(ii) An automatic guard which will remove the hands of the operator from the danger zone at every descent of the blade, used in conjunction with one-hand starting devices which require two distinct movements of the device to start the cutting motion, and so designed as to return positively to the nonstarting position after each complete cycle of the knife.

(6) Where two or more workers are employed at the same time on the same power-driven guillotine veneer cutter equipped with two-hand control, the device shall be so arranged that each worker shall be required to use both hands simultaneously on the controls to start the cutting motion, and at least one hand on a control to complete the cut.

(7) Power-driven guillotine veneer cutters, other than continuous trimmers, shall be provided, in addition to the brake or other stopping mechanism, with an emergency device which will prevent the machine from operating in the event of failure of the brake when the starting mechanism is in the nonstarting position.

(r) *Miscellaneous woodworking machines.* (1) The feed rolls of roll type glue spreaders shall be guarded by a semicylindrical guard. The bottom of the guard shall come to within three-eights inch of a plane formed by bottom or contact face of the feed roll where it touches the stock.

(2) Drag saws shall be so located as to give at least a 4-foot clearance for passage when the saw is at the extreme end of the stroke; or if such clearance is not obtainable, the saw and its driving mechanism shall be provided with a standard enclosure.

(3) For combination or universal woodworking machines each point of operation of any tool shall be guarded as required for such a tool in a separate machine.

(4) The mention of specific machines in paragraphs (a) thru (q) and this paragraph (r) of this section, inclusive, is not intended to exclude other woodworking machines from the requirement that suitable guards and exhaust hoods be provided to reduce to a minimum the hazard due to the point of operation of such machines.

(s) *Inspection and maintenance of woodworking machinery.* (1) Dull, badly set, improperly filed, or improperly tensioned saws shall be immediately removed from service, before they begin to cause the material to stick, jam, or kick back when it is fed to the saw at normal speed. Saws to which gum has adhered on the sides shall be immediately cleaned.

(2) All knives and cutting heads of woodworking machines shall be kept sharp, properly adjusted, and firmly secured. Where two or more knives are used in one head, they shall be properly balanced.

(3) Bearings shall be kept free from lost motion and shall be well lubricated.

(4) Arbors of all circular saws shall be free from play.

(5) Sharpening or tensioning of saw blades or cutters shall be done only by persons of demonstrated skill in this kind of work.

(6) Emphasis is placed upon the importance of maintaining cleanliness around woodworking machinery, particularly as regards the effective functioning of guards and the prevention of fire hazards in switch enclosures, bearings, and motors.

(7) All cracked saws shall be removed from service.

(8) The practice of inserting wedges between the saw disk and the collar to form what is commonly known as a "wobble saw" shall not be permitted.

(9) Push sticks or push blocks shall be provided at the work place in the several sizes and types suitable for the work to be done.

(10) Twists or kinks in bandsaws and band resaws shall be promptly removed with a hammer.

(11) To avoid vibration, brazed joints in bandsaws and band resaws shall be the same thickness as the saw blade.

(12) The knife blade of jointers shall be so installed and adjusted that it does not protrude more than one-eighth inch beyond the cylindrical body of the head. Push sticks or push blocks shall be provided at the work place in the several sizes and types suitable for the work to be done.

(13) Whenever veneer slicers or rotary veneer-cutting machines have been shutdown for the purpose of inserting logs or to make adjustments, operators shall make sure that machine is clear and other workmen are not in a hazardous position before starting the machine.

(14) Operators shall not ride the carriage of a veneer slicer.

§ 1910.214 Cooperage machinery.

(a) *Heading bolt sawing machine.* (1) Each heading saw shall be guarded by a hood curved to the contour of the saw. The hood shall cover the saw at least to the depth of the teeth, except for that portion actually used in making the cut. The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the saw. The hood shall be made of adequate strength to resist strains incidental to reasonable operation.

(2) The balance wheel shall be covered to enclose the rim and outside portion of the wheel. Expanded metal curved to fit the contour of the wheel is recommended.

(3) The swing carriage shall be provided with an effective device that will return the carriage automatically to a position in front of the saw. Such a device shall not depend entirely upon any rope, cord, or spring for its proper functioning. If a counterweight is used, a safety chain shall be attached to it to prevent dropping, should the bar break or the weight become disengaged. All bolts supporting the bar, weight, and chain shall be provided with cotter pins or equally effective devices. A bolt shall be put through the extreme end of the counterweight bar to prevent dropping of the weight.

(4) A limit stop shall be provided to prevent the carriage from swinging too far back and thereby exposing the unguarded portion of the saw to contact.

(b) *Bolt equalizer, stave, and heading saws (tilting table style).* (1) All heading and stave bolt equalizer saws shall be guarded by hoods, curved to the contour of the saws. The hood shall cover the saw at least to the depth of the teeth, except for that portion actually used in making the cut. The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the saws.

(2) Hoods shall be attached to each end of the tilting table and shall extend forward to cover the portion of the saws which cannot be enclosed by a stationary guard.

(3) A limit stop shall be provided to prevent the table from coming too far back and thereby exposing the unguarded portion of the saws to contact.

(c) *Barrel stave saws (cylindrical saws).* (1) Each machine of this type shall have the saw and the revolving part (head) to which the saw blade is bolted enclosed with a hinged guard to prevent accidental contact, except for that part of the saw immediately adjacent to the carriage, which is the point of operation of the saw.

(2) The exhaust hood shall be so arranged and maintained as to guard effectively the bottom portion of the saw. The hood shall be made of adequate strength to resist strains incidental to reasonable operation.

(d) *Hand-fed ripsaws.* (1) Each circular hand-fed ripsaw shall be guarded with a hood. The hood shall be stationary and cover the saw to a distance of approximately three-fourths inch above the stave being ripped. This will prevent the material being cut from being raised by upward centrifugal force of the saw in cases of pinching or binding before the stave reaches the splitter. The hood shall provide inside clearance between the top edge of saw and guard to allow an accidental blow to strike it to the table and not engage the teeth with the guard. The hood shall be constructed of heavy material, preferably metal. That portion of the saw remaining below the table shall be completely enclosed in an exhaust hood.

(2) Spreader requirements for this equipment are contained in § 1910.213 (c)(2).

(e) *Self-feed stave and heading equalizer saws.* (1) Self-feed equalizer saws shall be guarded with a hood guard which will cover the top and sides of the saws. The hood should adjust itself automatically to the thickness of, and remain in contact with, the material being cut.

(2) The portion of the saw blade extending beneath the mandrel shall be enclosed in an exhaust hood and be easily accessible for changing saws.

(f) *Stave and heading planers (single and double heads).* (1) The exhaust hood, or other guards, if no exhaust system is required, shall be so arranged and maintained as to guard effectively all cutting heads and knives of single and double planers.

(2) Feed rolls, except for such portion as may be necessary to admit stock, shall be completely enclosed.

(3) Pressure bars or holddown arrangements shall be properly adjusted to assure correct pressure and clearance at all times.

(g) *Stave jointing machines (wheel).* (1) Stave jointer wheels shall be covered on both sides with a removable metal hood connected to the exhaust system, except for that portion where the stock is applied to the knives.

(2) A limit stop should be installed on the frame to prevent any part of the carriage from coming in contact with any moving part of the wheel.

(3) The equipment described in subparagraphs (1) and (2) of this paragraph include double independent stave jointer wheels, double jointer stave wheels, single jointer stave wheels, and all kinds of keg stave jointer wheels.

(h) *Heading jointer and doweler machine (wheel).* (1) Each heading jointer shall be equipped with a removable guard covering the upper half of the wheel, except for that portion where the stock is applied to the knives.

(2) The lower portion of the wheel shall be guarded with sheet metal or expanded metal to prevent accidental contact with the knives.

(i) *Heading rounder.* The cutter head shall be enclosed in a hood attached to the exhaust system, arranged and maintained in such a manner as to guard effectively the entire cutting mechanism, except for that portion of the cutting head where the stock is applied.

(j) *Power windlass machine.* Windlass machines having counterweights shall operate with the weights in a stationary casing. On all machines having a friction gear, the gear shall be properly guarded.

(k) *Crozing machine (stationary heads).* Feed chains and sprockets shall be completely enclosed. This includes all types of barrel, keg, bucket, tub, and individual stave crozers, chamfering, crozing, and doweling machines.

(l) *Heading-up machine.* The outside portion and teeth of both drive gears for the racks shall be completely guarded. This includes all types of heading-up machines.

(m) *Head charring machine.* All tripping mechanisms shall be completely guarded.

(n) *Bilge truss hoop ring removing machine.* (1) Both eccentric cams and gear works on horizontal machines shall be guarded.

(2) Combined flywheel and gear shall be completely enclosed by a guard. This includes the horizontal and upright-type machines.

(o) *Hoop elevators and conveyors.* Lower sprockets and chains shall be guarded by complete enclosure to a height of at least 7 feet.

(p) *Barrel sanding machine.* Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley. This guard may be a part of the exhaust system. The unused run of the sanding belt shall be enclosed.

(q) *Hoop drivers and trussers.* (1) All friction pulleys shall be enclosed by a guard. A hinged gate should be provided for that portion of the guard covering adjustments to the friction blocks.

(2) The foregoing recommendation covers drivers for keg hoops, tin barrel hoops, truss hoops, and both screw and rack and pinion-type hoop drivers.

(r) *Head sanding machine.* The exhaust hood of automatic horizontal disk head sanders shall be so arranged as to enclose each disk, except for that portion necessary for the application of the barrel being finished.

(s) *Hand jointer.* All hand-fed jointers shall be guarded in accordance with the provisions of § 1910.213(j).

(t) *Hoop punching and coiling machine.* Miter gears, spur gears, drive pulley, and pulley for coiling attachment shall be guarded. This includes the horizontal hoop punching and coiling machine as well as the upright hoop punching machine.

(u) *Hoop riveting machine.* The balance and drive wheels shall be effectively guarded. This includes automatic, single, and double hoop riveters.

(v) *Hoop flaring and expanding machine.* Gearing shall be completely enclosed.

(w) *Inspection and maintenance of cooperage machinery.* For inspection and maintenance of cooperage machinery see § 1910.213(s).

§ 1910.215 Abrasive wheel machinery.

(a) *General requirements*—(1) *Machine guarding.* Abrasive wheels shall be used only on machines provided with safety guards as defined in the following paragraphs of this section, except:

(i) Wheels used for internal work while within the work being ground;

(ii) Mounted wheels, used in portable operations, 2 inches and smaller in diameter; and

(iii) Types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where the work offers protection.

(2) *Guard design.* The safety guard shall cover the spindle end, nut, and flange projections. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard, except:

(i) Safety guards on all operations where the work provides a suitable measure of protection to the operator, may be so constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted; and

(ii) The spindle end, nut, and outer flange may be exposed on machines designed as portable saws.

(3) *Flanges.* Grinding machines shall be equipped with flanges in accordance with paragraph (c) of this section.

(4) *Work rests.* On offhand grinding machines, work rests shall be used to support the work. They shall be of rigid construction and designed to be adjustable to compensate for wheel wear. Work rests shall be kept adjusted closely to the wheel with a maximum opening of one-eighth inch to prevent the work from being jammed between the wheel and the rest, which may cause wheel breakage. The work rest shall be securely clamped after each adjustment. The adjustment shall not be made with the wheel in motion.

(5) *Excluded machinery.* Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered by this section.

(b) *Guarding of abrasive wheel machinery*—(1) *Cup wheels.* Cup wheels (Types 6 and 11) shall be protected by:

(i) Safety guards as specified in subparagraphs (1) through (10) of this paragraph:

(ii) Band type guards as specified in subparagraph (11) of this paragraph; and

(iii) Special "Revolving Cup Guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one-third of the wheel thickness. The mounting features shall conform with all requirements of this section. It is necessary to maintain clearance between the wheel side and the guard. This clearance shall not exceed one-sixteenth inch.

(2) *Guard exposure angles.* The maximum exposure angles specified in subparagraphs (3) through (8) of this paragraph shall not be exceeded. Visors or other accessory equipment shall not be included as a part of the guard when measuring the guard opening, unless such equipment has strength equal to that of the guard.

(3) *Bench and floor stands.* The angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as bench and floor stands should not exceed 90° or one-fourth of the periphery. This exposure shall begin at a point not more than 65° above the horizontal plane of the wheel spindle. (See Figures O-6 and O-7 and subparagraph (9) of this paragraph.)

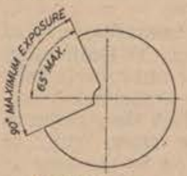


FIGURE NO. 0-6

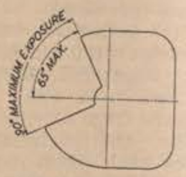


FIGURE NO. 0-7

Wherever the nature of the work requires contact with the wheel below the horizontal plane of the spindle, the exposure shall not exceed 125°. (See Figures O-8 and O-9.)

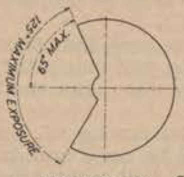


FIGURE NO. 0-8

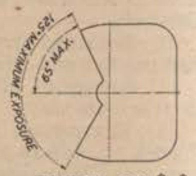


FIGURE NO. 0-9

(4) *Cylindrical grinders.* The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cylindrical grinding machines shall not exceed 180°. This exposure shall begin at a point not more than 65° above the horizontal plane of the wheel spindle. (See Figures O-10 and O-11 and subparagraph (9) of this paragraph.)

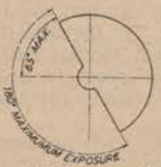


FIGURE NO. 0-10

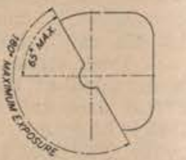


FIGURE NO. 0-11

(5) *Surface grinders and cutting-off machines.* The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on cutting-off machines and on surface grinding machines which employ the wheel periphery shall not exceed 150°. This exposure shall begin at a point not less than 15° below the horizontal plane of the wheel spindle. (See Figures O-12 and O-13)

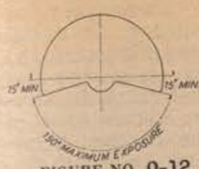


FIGURE NO. O-12

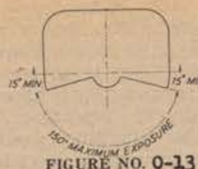


FIGURE NO. O-13

(6) *Swing frame grinders.* The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on machines known as swing frame grinding machines shall not exceed 180°, and the top half of the wheel shall be enclosed at all times. (See Figure O-14 and O-15.)

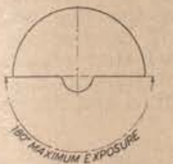


FIGURE NO. O-14

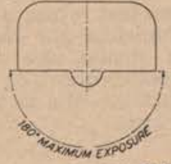


FIGURE NO. O-15

(7) *Automatic snagging machines.* The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on grinders known as automatic snagging machines shall not exceed 180° and the top half of the wheel shall be enclosed at all times. (See Figures O-14 and O-15.)

(8) *Top grinding.* Where the work is applied to the wheel above the horizontal centerline, the exposure of the grinding wheel periphery shall be as small as possible and shall not exceed 60°. (See Figures O-16 and O-17.)

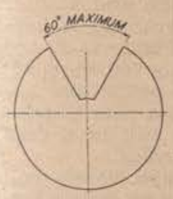


FIGURE NO. O-16

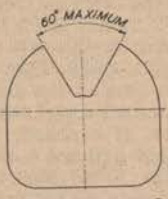


FIGURE NO. O-17

(9) *Exposure adjustment.* Safety guards of the types described in subparagraphs (3) and (4) of this paragraph, where the operator stands in front of the opening, shall be constructed so that the peripheral protecting member can be adjusted to the constantly decreasing diameter of the wheel. The maximum angular exposure above the horizontal plane of the wheel spindle as specified in subparagraphs (3) and (4) of this paragraph shall never be exceeded, and the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top shall never exceed one-fourth inch. (See Figures O-18, O-19, O-20, O-21, O-22, and O-23.)

(10) *Material requirements and minimum dimensions.* (i) See Figures O-36 and O-37 and Table O-9 for minimum basic thickness of peripheral and side members for various types of safety guards and classes of service.

(ii) If operating speed does not exceed 8,000 surface feet per minute cast iron safety guards, malleable iron guards or other guards as described in subparagraph (10)(iii) of this paragraph shall be used.

(iii) Cast steel, or structural steel, safety guards as specified in Figures O-36 and O-37 and Table O-9 shall be used where operating speeds of wheels are faster than 8,000 surface feet per minute up to a maximum of 16,000 surface feet per minute.

(iv) For cutting-off wheels 16 inches diameter and smaller and where speed does not exceed 16,000 surface feet per minute, cast iron or malleable iron safety guards as specified in Figures O-36 and O-37, and in Table O-9 shall be used.

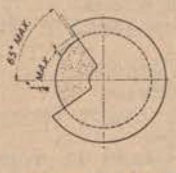


FIGURE NO. O-18

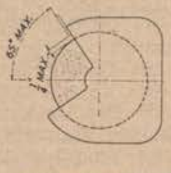


FIGURE NO. O-19

CORRECT

Showing adjustable tongue giving required angular protection for all sizes of wheel used.

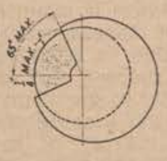


FIGURE NO. O-20

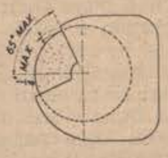


FIGURE NO. O-21

CORRECT

Showing movable guard with opening small enough to give required protection for smallest size wheel used.

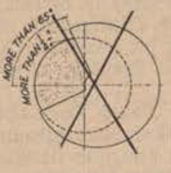


FIGURE NO. O-22

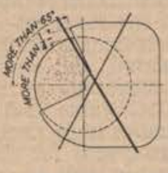


FIGURE NO. O-23

INCORRECT

Showing movable guard with size of opening correct for full size wheel but too large for smaller wheels.

(v) For cutting-off wheels larger than 16 inches diameter and where speed does not exceed 14,200 surface feet per minute, safety guards as specified in figures O-27 and O-28, and in Table O-1 shall be used.

(vi) For thread grinding wheels not exceeding 1 inch in thickness cast iron or malleable iron safety guards as specified in Figures O-36 and O-37, and in Table O-9 shall be used.

(11) *Band type guards—general specifications.* Band type guards shall conform to the following general specifications:

(i) The bands shall be of steel plate or other material of equal or greater strength. They shall be continuous, the ends being either riveted, bolted, or welded together in such a manner as to leave the inside free from projections.

(ii) The inside diameter of the band shall not be more than 1 inch larger than the outside diameter of the wheel, and shall be mounted as nearly concentric with the wheel as practicable.

(iii) The band shall be of sufficient width and its position kept so adjusted that at no time will the wheel protrude beyond the edge of the band a distance greater than that indicated in Figure O-29 and in Table O-2 or the wall thickness (W), whichever is smaller.

(12) *Guard design specifications.* Abrasive wheel machinery guards shall meet the design specifications of the American National Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, ANSI B7.1-1970. This requirement shall not apply to natural sandstone wheels or metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface.

(c) *Flanges*—(1) *General requirements.* All abrasive wheels shall be mounted between flanges which shall not be less than one-third the diameter of the wheel.

(i) Exceptions:

(*a*) Mounted wheels.

(*b*) Portable wheels with threaded inserts or projecting studs.

(*c*) Abrasive discs (inserted nut, inserted washer and projecting stud type).

(*d*) Plate mounted wheels.

(*e*) Cylinders, cup, or segmental wheels that are mounted in chucks.

(*f*) Types 27 and 28 wheels.

(*g*) Certain internal wheels.

(*h*) Modified types 6 and 11 wheels (terrazzo).

(*i*) Cutting-off wheels, Types 1 and 27A (see subdivisions (ii) and (iii) of this subparagraph).

(ii) Type 1 cutting-off wheels are to be mounted between properly relieved flanges which have matching bearing surfaces. Such flanges shall be at least one-fourth the wheel diameter.

(iii) Type 27A cutting-off wheels are designed to be mounted by means of flat, not relieved, flanges having matching bearing surfaces and which may be less than one-third but shall not be less than one-fourth the wheel diameter. (See Figure O-24 for one such type of mounting.)

(iv) There are three general types of flanges:

(*a*) straight relieved flanges (see Figure O-32);

(*b*) straight unrelieved flanges (see Figure O-30);

(*c*) adaptor flanges (see Figures O-33 and O-34);

(v) Regardless of flange type used, the wheel shall always be guarded. Blotters shall be used in accordance with subparagraph (6) of this paragraph.

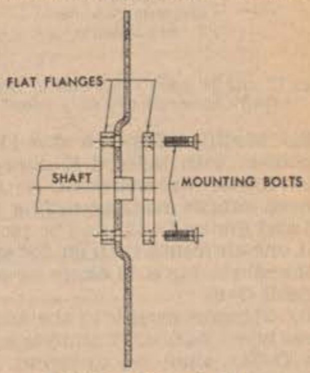


FIGURE NO. O-24

The Type 27A Wheel is mounted between flat non-relieved flanges of equal bearing surfaces.

(2) *Design and material.* (i) Flanges shall be of such design as to satisfactorily transmit the driving torque from the spindle to the grinding wheel.

(ii) Flanges may be made of steel, cast iron, or other material of equal or greater strength and rigidity.

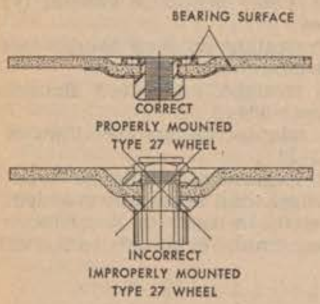
(iii) Flanges shall be designed with respect to rigidity so that when tightened, the radial width of bearing surface of contact on the wheel is maintained. (See Table O–6 and Figure O–32.)

(3) *Finish and balance.* Flanges shall be dimensionally accurate and in good balance. There shall be no rough surfaces or sharp edges.

(4) *Uniformity of diameter.* (i) Both flanges, of any type, between which a wheel is mounted, shall be of the same diameter and have equal bearing surface. Exceptions are set forth in the remaining subdivisions of this subparagraph.

(ii) Type 27 and Type 28 wheels, because of their shape and usage, require specially designed adaptors. The back flange shall extend beyond the central hub or raised portion and contact the wheel to counteract the side pressure on the wheel in use. The adaptor nut which is less than the minimum one-third diameter of wheel fits in the depressed side of wheel to prevent interference in side grinding and serves to drive the wheel by its clamping force against the depressed portion of the back flange The variance in flange diameters, the adaptor nut being less than one-third wheel diameter, and the use of side pressure in wheel operation limits the use to reinforced organic bonded wheels. Mounts which are affixed to the wheel by the manufacturer shall not be reused. Type 27 and Type 28 wheels shall be used only with a safety guard located between wheel and operator during use. (See Figure O–24–A.)

FIGURE NO. 0-24-A



Types 27 and 28 wheels, because of their shape, require specially designed adaptors.

(iii) Modified Types 6 and 11 wheels (terrazzo) with tapered K dimension.

(5) *Recess and undercut.* (i) Straight relieved flanges made according to Table O–6 and Figure O–32 shall be recessed at least one-sixteenth inch on the side next to the wheel for a distance as specified in Table O–6.

(ii) Straight flanges of the adaptor or sleeve type (Table O–7 and Figures O–33 and O–34) shall be undercut so that there will be no bearing on the sides of the wheel within one-eighth inch of the arbor hole.

(6) *Blotters.* (i) Blotters (compressible washers) shall always be used between flanges and abrasive wheel surfaces to insure uniform distribution of flange pressure. (See paragraph (d)(5) of this section.)

(ii) Exception:

(*a*) Mounted wheels.

(*b*) Abrasive discs (inserted nut, inserted washer, and projecting stud type).

(*c*) Plate mounted wheels.

(*d*) Cylinders, cups, or segmental wheels that are mounted in chucks.

(*e*) Types 27 and 28 wheels.

(*f*) Certain Type 1 and Type 27A cutting-off wheels.

(*g*) Certain internal wheels.

(*h*) Type 4 tapered wheels.

(*i*) Diamond wheels, except certain vitrified diamond wheels.

(*j*) Modified Types 6 and 11 wheel (terrazzo)—blotters applied flat side of wheel only.

(7) *Driving flange.* The driving flange shall be securely fastened to the spindle and the bearing surface shall run true. When more than one wheel is mounted between a single set of flanges, wheels may be cemented together or separated by specially designed spacers. Spacers shall be equal in diameter to the mounting flanges and have equal bearing surfaces. (See paragraph (d)(6) of this section.)

(8) *Dimensions.* (i) Tables O–4 and O–6 and Figures O–30 and O–32 show minimum dimensions for straight relieved and unrelieved flanges for use with wheels with small holes that fit directly on the machine spindle. Dimensions of such flanges shall never be less than indicated and should be greater where practicable.

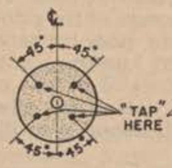
(ii) Table O–5, and Table O–7 and Figures O–31, O–33, O–34 show minimum dimensions for straight adaptor flanges for use with wheels having holes larger than the spindle. Dimensions of such adaptor flanges shall never be less than indicated and should be greater where practicable.

(iii) Table O–8 and Figure O–35 show minimum dimensions for straight flanges that are an integral part of wheel sleeves which are frequently used on precision grinding machines. Dimensions of such flanges shall never be less than indicated and should be greater where practicable.

(9) *Repairs and maintenance.* All flanges shall be maintained in good condition. When the bearing surfaces become worn, warped, sprung, or damaged they should be trued or refaced. When refacing or truing, care shall be exercised to make sure that proper relief and rigidity is maintained as specified in subparagraphs (2) and (5) of this paragraph and they shall be replaced when they do not conform to these subparagraphs and Table O–4, Figure O–30, Table O–5, Figure O–31, Table O–6, Figure O–32, and Table O–8, Figure O–35. Failure to observe these rules might cause excessive flange pressure around the hole of the wheel. This is especially true of wheel-sleeve or adaptor flanges.

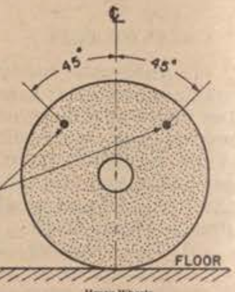
(d) *Mounting*—(1) *Inspection.* Immediately before mounting, all wheels shall be closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel. Wheels should be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead), they shall not be used. This is known as the "Ring Test".

(i) Wheels must be dry and free from sawdust when applying the ring test, otherwise the sound will be deadened. It should also be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.



Light Wheels
Suspend from hole by
small pin or finger

FIGURE NO. 0-25



Heavy Wheels
Support on clean hard floor

FIGURE NO. 0-26

(ii) "Tap" wheels about 45° each side of the vertical centerline and about 1 or 2 inches from the periphery as indicated by the spots in Figure O–25 and Figure O–26. Then rotate the wheel 45° and repeat the test. A sound and undamaged wheel will give a clear metallic tone. If cracked, there will be a dead sound and not a clear "ring."

(2) *Arbor size.* Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion. To accomplish this, the machine spindle shall be made to nominal (standard) size plus zero minus .002 inch, and the wheel hole shall be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.

(3) *Surface condition.* All contact surfaces of wheels, blotters and flanges shall be flat and free of foreign matter.

(4) *Bushing.* When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

(5) *Blotters.* When blotters or flange facings of compressible material are required, they shall cover entire contact area of wheel flanges. Highly compressible material such as blotting paper as normally used should not exceed .025 inch in thickness. If material of lower compressibility is used, greater thickness

may be necessary. Blotters need not be used with the following types of wheels:

(i) Mounted wheels.

(ii) Abrasive discs (inserted nut, inserted washer, and projecting-stud type).

(iii) Plate mounted wheels.

(iv) Cylinders, cups, or segmental wheels that are mounted in chucks.

(v) Types 27 and 28 wheels.

(vi) Certain Type 1 and Type 27A cutting-off wheels.

(vii) Certain internal wheels.

(viii) Type 4 tapered wheels.

(ix) Diamond wheels, except certain vitrified diamond wheels.

(6) *Multiple wheel mounting.* When more than one wheel is mounted between a single set of flanges, wheels may be cemented together or separated by specially designed spacers. Spacers shall be equal in diameter to the mounting flanges and have equal bearing surfaces. When mounting wheels which have not been cemented together, or ones which do not utilize separating spacers, care must be exercised to use wheels specially manufactured for that purpose.

(7) *Replacing safety guard.* After mounting a wheel, care should be taken to see that the safety guard is properly positioned before starting the wheel.

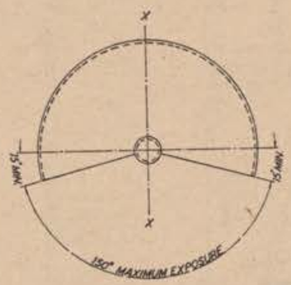
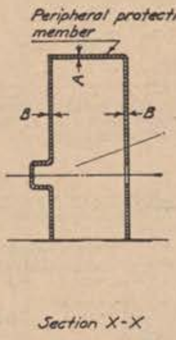


FIGURE NO. 0-27



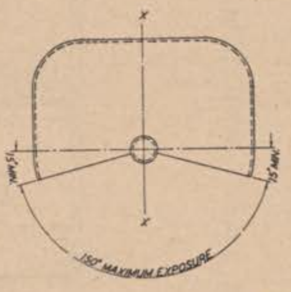


FIGURE NO. 0-28

TABLE O-1—MINIMUM BASIC THICKNESS FOR PERIPHERAL AND SIDE MEMBERS FOR SAFETY GUARDS USED WITH CUTTING-OFF WHEELS

Material used in construction of guard	Maximum thickness of cutting off wheel	Speed not to exceed	Cutting off wheel diameters									
			6 to 11 inches		Over 11 to 20 inches		Over 20 to 30 inches		Over 30 to 48 inches		Over 48 to 72 inches	
			A	B	A	B	A	B	A	B	A	B
Structural steel (min. tensile strength 60,000 p.s.i.)	½ inch or less	14,200 SFPM	1/16	1/16	3/32	3/32	⅛	⅛	3/16	3/16	¼	¼
	½ inch or less	16,000 SFPM	3/32	⅛	⅛	⅛	3/16	⅛	¼	3/16	5/16	¼

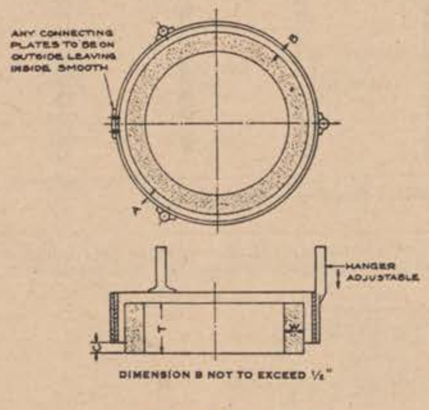

ANY CONNECTING PLATES TO BE ON OUTSIDE LEAVING INSIDE SMOOTH
B
T
HANGER ADJUSTABLE
A
T
B
DIMENSION B NOT TO EXCEED ½"

FIGURE NO. 0-29

TABLE O-2—EXPOSURE VERSUS WHEEL THICKNESS

Overall thickness of wheel (T) (inches)	*Maximum exposure of wheel (C) (inches)*
½	¼
1	½
2	¾
3	1
4	1½
5 and over	2

TABLE O-3—GUIDE FOR CONSTRUCTION OF BAND TYPE GUARDS

[Maximum Wheel Speed 7,000 SFPM]

Minimum material specifications	Diameter of wheel	Minimum thickness of band A	Minimum diameter of rivets	Maximum distance between centers of rivets
	Inches	*Inches*	*Inches*	*Inches*
Hot rolled steel SAE 1008	Under 8	1/16	3/16	¾
	8 to 24	⅛	¼	1
	Over 24 to 30	¼	⅜	1¼

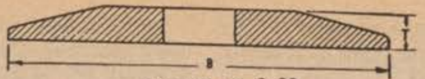


FIGURE NO. 0-30

Driving flange secured to spindle for use only on portable wheels with threaded inserts or projecting studs.

TABLE O-4—MINIMUM DIMENSIONS FOR STRAIGHT UNRELIEVED FLANGES FOR WHEELS WITH THREADED INSERTS OR PROJECTING STUDS

A Diameter of wheel	B[1] Minimum outside diameter of flange	T Minimum thickness of flange
Inches	*Inches*	*Inches*
1	5/8	1/8
2	1	1/8
3	1	3/16
4	1 3/8	3/16
5	1 3/4	1/4
6	2	3/8

[1] NOTE: Must be large enough to extend beyond the bushing. Where prong anchor or cupback bushing are used, this footnote does not apply.

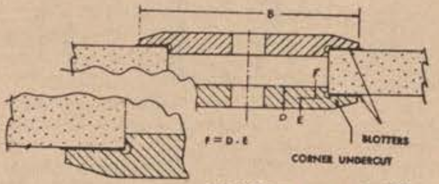


FIGURE NO. 0-31

TABLE O-5—MINIMUM DIMENSIONS FOR STRAIGHT ADAPTOR FLANGE—FOR ORGANIC BONDED WHEELS OVER 1¼ INCHES THICK[1]

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F[1] (D-E) minimum thickness
Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
12 to 14	4	6	7/8	3/8	1/2
	5	7	7/8	3/8	1/2
	6	8	7/8	3/8	1/2
Larger than 14 to 18	4	6	7/8	3/8	1/2
	5	7	7/8	3/8	1/2
	6	8	7/8	3/8	1/2
	7	9	7/8	3/8	1/2
	8	10	7/8	3/8	1/2
Larger than 18 to 24	6	8	1	1/2	1/2
	7	9	1	1/2	1/2
	8	10	1	1/2	1/2
	10	12	1	1/2	1/2
	12	14	1	1/2	1/2
Larger than 24 to 30	12	15	1	1/2	1/2
Larger than 30 to 36	12	15	1 3/8	7/8	1/2

[1] For wheels under 1¼ inches thick F dimension shall not exceed 40 percent of wheel thickness.

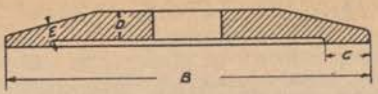


FIGURE NO. 0-32

Driving flange secured to spindle.

TABLE O-6—MINIMUM DIMENSIONS FOR STRAIGHT RELIEVED FLANGES

A[1]	B	C		D	E
Diameter of wheel	Minimum outside diameter of flanges	Radial width of bearing surface		Minimum thickness of flange at bore	Minimum thickness of flange at edge of recess
		Minimum	Maximum		
Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
1	⅜	1/16	⅛	1/16	1/16
2	¾	⅛	3/16	⅛	3/32
3	1	⅛	3/16	3/16	3/32
4	1⅜	⅛	3/16	3/16	⅛
5	1¾	3/16	¼	¼	⅛
6	2	¼	½	⅜	3/16
7	2½	¼	½	⅜	3/16
8	3	¼	½	⅜	3/16
10	3½	5/16	⅝	⅜	¼
12	4	5/16	⅝	½	5/16
14	4½	⅜	¾	½	5/16
16	5½	½	1	½	5/16
18	6	½	1	⅝	⅜
20	7	⅝	1¼	⅝	⅜
22	7½	⅝	1¼	⅝	7/16
24	8	¾	1¼	⅝	7/16
26	8½	¾	1¼	⅝	½
28	10	⅞	1½	¾	½
30	10	⅞	1½	¾	⅝
36	12	1	2	⅞	¾
42	14	1	2	⅞	¾
48	16	1¼	2	1⅛	1
60	20	1¼	2	1¼	1⅛
72	24	1½	2½	1⅜	1¼

[1] Flanges for wheels under 2 inches diameter may be unrelieved and shall be maintained flat and true.

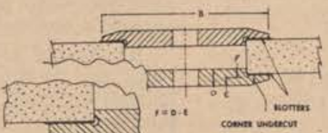


FIGURE NO. 0-33

Central Nut Mounting

Driving flange secured to spindle.

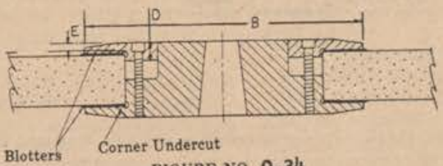


FIGURE NO. 0-34

Multiple Screw Mounting

Driving flange secured to spindle.

TABLE O-7—MINIMUM DIMENSIONS FOR STRAIGHT FLANGES—FOR MECHANICAL GRINDERS 12,500 S.F.P.M. TO 16,500 S.F.P.M.[1]

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F[2] (D-E) minimum thickness
20	6	8	1	½	½
20	8	10	1½	¾	¾
24	12	15	2	1	1
30	12	15	2	1	1
36	12	15	2	1	1

[1] Flanges shall be of steel, quality SAE 1040 or equivalent, annealed plate, heat treated to R$_c$ 25-30.
[2] For wheels under 1¼ inch thick F dimension shall not exceed 40 percent of wheel thickness.

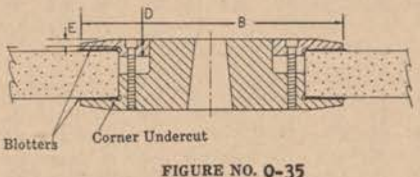


FIGURE NO. 0-35

Driving flange secured to spindle.

TABLE O-8—MINIMUM DIMENSIONS FOR STRAIGHT FLANGES USED AS WHEEL SLEEVES FOR PRECISION GRINDING ONLY

Wheel diameter	Wheel hole diameter	B Minimum outside diameter of flange	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut
Inches	*Inches*	*Inches*	*Inches*	*Inches*
12 to 14	5	7	½	7/16
Larger than 14 to 20	5	7	⅝	7/16
	6	8	⅝	7/16
	8	10	⅝	7/16
	10	11½	⅝	7/16
	12	13½	⅝	7/16
Larger than 20 to 30	8	10	¾	½
	10	11½	¾	½
	12	13½	¾	½
	16	17½	¾	½
Larger than 30 to 42	12	13½	¾	½
	16	17½	¾	½
	18	19½	¾	½
	20	21½	¾	½
Larger than 42 to 60	16	20	1	¾
	20	24	1	¾
	24	29	1⅛	⅞

NOTE: These flanges may be clamped together by means of a central nut, or by a series of bolts or some other equivalent means of fastening. For hole sizes smaller than shown in this table, use table 12.

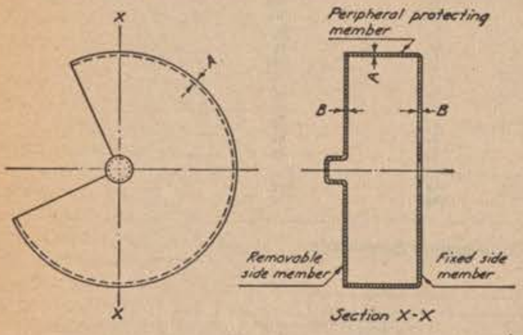


FIGURE NO. O-36

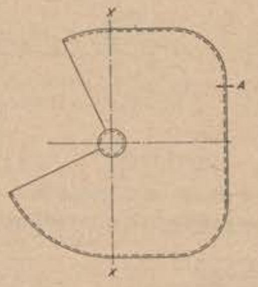


FIGURE NO. O-37

TABLE O-9—MINIMUM BASIC THICKNESSES OF PERIPHERAL AND SIDE MEMBERS FOR SAFETY GUARDS

Material used in construction of guard	Maximum thickness of grinding wheel	Grinding wheel diameters: 3 to 6 inches A	3 to 6 inches B	Over 6 to 12 inches A	Over 6 to 12 inches B	Over 12 to 16 inches A	Over 12 to 16 inches B	Over 16 to 20 inches A	Over 16 to 20 inches B	Over 20 to 24 inches A	Over 20 to 24 inches B	Over 24 to 30 inches A	Over 24 to 30 inches B	Over 30 to 48 inches A	Over 30 to 48 inches B
	Inches	*Inches*		*Inches*		*Inches*		*Inches*		*Inches*		*Inches*		*Inches*	
Material satisfactory [1] for speeds up to 8,000 SFPM. Cast iron (min. tensile strength 20,000 p.s.i.) Class 20.	2	¼	¼	⅜	5/16	½	⅜	⅝	½	⅞	⅝	1	¾	1¼	1
	4	5/16	5/16	⅜	5/16	½	⅜	¾	⅝	1	⅝	1⅛	¾	1⅜	1
	6	⅜	5/16	½	7/16	⅝	½	1	⅝	1⅛	¾	1¼	⅞	1½	1⅛
	8			⅝	9/16	⅞	¾	1	¾	1⅛	¾	1¼	⅞	1½	1⅛
	10			¾	11/16	⅞	¾	1	¾	1⅛	¾	1¼	⅞	1½	1⅛
	16					1⅛	1	1¼	1	1 5/16	1	1 7/16	1 1/16	1¾	1⅜
	20							1⅜	1⅛	1⅜	1⅛	1½	1⅜	2	1⅝
Material satisfactory [1] for speeds up to 9,000 SFPM. Malleable iron (min. tensile strength 50,000 p.s.i.) Grade 32510.	2	¼	¼	⅜	5/16	½	⅜	⅝	½	¾	⅝	⅞	¾	1	⅞
	4	5/16	5/16	⅜	5/16	½	⅜	⅝	½	¾	⅝	⅞	¾	1⅛	⅞
	6	⅜	5/16	½	7/16	⅝	½	¾	⅝	⅞	⅝	1	¾	1¼	⅞
	8			½	7/16	⅝	½	¾	⅝	⅞	⅝	1	¾	1¼	⅞
	10			½	7/16	⅝	½	¾	⅝	⅞	⅝	1	¾	1¼	⅞
	16					13/16	11/16	13/16	11/16	1	¾	1⅛	⅞	1⅜	1
	20							⅞	¾	1	¾	1⅛	⅞	1½	1⅛
Materials satisfactory [1] for speeds up to 16,000 SFPM. Steel castings (min tensile strength 60,000 p.s.i.) Grade V60-30.	2	¼	¼	5/16	5/16	⅜	⅜	½	7/16	⅝	½	¾	⅝	⅞	¾
	4	¼	¼	½	½	½	½	9/16	½	⅝	½	¾	⅝	1	¾
	6	⅜	¼	¾	⅝	¾	⅝	¾	⅝	13/16	11/16	13/16	11/16	1⅛	¾
	8			⅞	¾	⅞	¾	⅞	¾	⅞	¾	15/16	13/16	1⅜	1
	10			1	⅞	1	⅞	1	⅞	1⅛	15/16	1⅛	1	1 7/16	1 1/16
	16					1¼	1⅛	1¼	1⅛	1¼	1⅛	1¼	1⅛	1 13/16	1 7/16
	20							1⅜	1¼	1⅜	1¼	1 7/16	1 5/16	2 1/16	1 11/16
Structural steel (min. tensile strength 60,000 p.s.i.).	2	⅛	1/16	5/16	¼	5/16	¼	5/16	¼	5/16	¼	⅜	5/16	½	⅜
	4	⅛	1/16	⅜	5/16	⅜	5/16	⅜	5/16	⅜	5/16	⅜	5/16	½	⅜
	6	3/16	1/16	½	⅜	7/16	⅜	7/16	⅜	7/16	⅜	7/16	⅜	¾	½
	8			½	⅜	9/16	7/16	9/16	7/16	9/16	7/16	⅝	½	¾	½
	10			9/16	7/16	⅝	½	⅝	½	⅝	½	⅝	½	⅞	⅝
	16					⅝	9/16	¾	⅝	¾	⅝	13/16	11/16	1 1/16	13/16
	20							13/16	11/16	13/16	11/16	⅞	¾	1 3/16	15/16

[1] The recommendations listed in the above table are guides for the conditions stated. Other material, designs or dimensions affording equal or superior protection are also acceptable.

§ 1910.216 Mills and calenders in the rubber and plastics industries.

(a) *General requirements*—(1) *New installations*. All new installations on or after August 31, 1971, shall be in conformity with this section.

(2) *Existing installations*. All existing plant installations or equipment contracted for prior to August 31, 1971, shall comply with this section.

(3) *Auxiliary equipment*. Mechanical and electrical equipment and auxiliaries shall be installed in accordance with this section and Subpart S of this part.

(4) *Mill roll heights*. All new mill installations shall be installed so that the top of the operating rolls is not less than 50 inches above the level on which the operator stands, irrespective of the size of the mill. This distance shall apply to the actual working level, whether it be at the general floor level, in a pit, or on a platform.

(b) *Mill safety controls*—(1) *Safety trip control*. A safety trip control shall be provided in front and in back of each mill. It shall be accessible and shall operate readily on contact. The safety trip control shall be one of the following types or a combination thereof:

(i) *Pressure-sensitive body bars*. Installed at front and back of each mill having a 46-inch roll height or over. These bars shall operate readily by pressure of the mill operator's body. Pressure-sensitive body bars should be installed on new equipment.

(ii) *Safety triprod*. Installed in the front and in the back of each mill and located within 2 inches of a vertical plane tangent to the front and rear rolls. The top rods shall be not more than 72 inches above the level on which the operator stands. The triprods shall be accessible and shall operate readily whether the rods are pushed or pulled.

(iii) *Safety tripwire cable or wire center cord*. Installed in the front and in the back of each mill and located within 2 inches of a vertical plane tangent to the front and rear rolls. The cables shall not be more than 72 inches above the level on which the operator stands. The tripwire cable or wire center cord shall operate readily whether cable or cord is pushed or pulled.

(2) *Fixed guards*. A fixed bar across the front and one across the back of the mill approximately 40 inches vertically above the working level and 20 inches horizontally from the crown face of the roll should be used where they are applicable.

(3) *Auxiliary equipment*. All auxiliary equipment such as mill divider, support bars, spray pipes, feed conveyors, strip knives, etc., shall be located in such a manner as to avoid interference with access to and operation of safety devices.

(c) *Calender safety controls*—(1) *Safety trip, face*. A safety triprod, cable, or wire center cord shall be provided across each pair of in-running rolls extending the length of the face of the rolls. It shall be readily accessible and operate whether pushed or pulled. The safety tripping devices shall be located within reach of the operator and the bite.

(2) *Safety trip, side.* On both sides of the calender and near each end of the face of the roll, there shall be a cable or wire center cord connected to the safety trip. These lines should be not more than 12 inches from the faces of the respective rolls and not less than 2 inches from the calender frame. They should be anchored to the frame not more than 6 inches from the floor or operator's platform. They shall operate readily when pushed or pulled.

(d) *Protection by location*—(1) *Mills.* Where a mill is so installed that persons cannot normally reach through, over, under, or around to come in contact with the roll bite or be caught between a roll and an adjacent object, then, provided such elements are made a fixed part of a mill, safety control devices listed in paragraph (b) of this section shall not apply.

(2) *Calenders.* Where a calender is so installed that persons cannot normally reach through, over, under, or around to come in contact with the roll bite or be caught between a roll and an adjacent object, then, provided such elements are made a fixed part of a calender, safety control devices listed in paragraph (c) of this section shall not apply.

(e) *Trip and emergency switches.* All trip and emergency switches shall not be of the automatically resetting type, but shall require manual resetting.

(f) *Stopping limits*—(1) *Determination of distance of travel.* All measurements on mills and calenders shall be taken with the rolls running empty at maximum operating speed. Stopping distances shall be expressed in inches of surface travel of the roll from the instant the emergency stopping device is actuated.

(2) *Stopping limits for mills.* All mills irrespective of the size of the rolls or their arrangement (individually or group-driven) shall be stopped within a distance, as measured in inches of surface travel, not greater than 1½ percent of the peripheral no-load surface speeds of the respective rolls as determined in feet per minute.

(3) *Stopping limits for calenders.* (i) All calenders, irrespective of size of the rolls or their configuration, shall be stopped within a distance, as measured in inches of surface travel, not greater than 1¾ percent of the peripheral no-load surface speeds of the respective calender rolls as determined in feet per minute.

(ii) Where speeds above 250 feet per minute as measured on the surface of the drive roll are used, stopping distances of more than 1¾ percent are permissible. Such stopping distances shall be subject to engineering determination.

(g) *Alarm.* Where an exposure is created by the operation, and the operators are not within sight or hearing of other employees, a suitable alarm device should be provided so that assistance will be available in case of accidents.

§ 1910.217 Mechanical power presses.

(a) *General requirements*—(1) *New installations.* The requirements of this section pertaining to construction shall apply to all mechanical power presses installed on or after August 31, 1971.

(2) *Former installations.* All mechanical power presses installed prior to August 31, 1971, shall be brought into conformity with the requirements of this section not later than August 31, 1974.

(3) *All installations.* The requirements of this section pertaining to the care and use of mechanical power presses shall apply to all mechanical power press operations as of February 15, 1972.

(4) *Reconstruction and modification.* It shall be the responsibility of any person reconstructing, or modifying a mechanical power press to do so in accordance with paragraph (b) of this section.

(5) *Excluded machines.* Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators are excluded from the requirements of this section.

(b) *Mechanical power press guarding and construction, general*—(1) *Hazards to personnel associated with broken or falling machine components.* Machine components shall be designed, secured, or covered to minimize hazards caused by breakage, or loosening and falling or release of mechanical energy (i.e. broken springs).

(2) *Brakes.* Friction brakes provided for stopping or holding the slide movement shall be set with compression springs. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

(3) *Machines using full revolution positive clutches.* (i) Machines using full revolution clutches shall incorporate a single-stroke mechanism.

(ii) If the single-stroke mechanism is dependent upon spring action, the spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, and designed to prevent interleaving of the spring coils in event of breakage.

(4) *Foot pedals (treadle).* (i) The pedal mechanism shall be protected to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.

(ii) A pad with a nonslip contact area shall be firmly attached to the pedal.

(iii) The pedal return spring(s) shall be of the compression type, operating on a rod or guided within a hole or tube, or designed to prevent interleaving of spring coils in event of breakage.

(iv) If pedal counterweights are provided, the path of the travel of the weight shall be enclosed.

(5) *Hand operated levers.* (i) Hand-lever-operated power presses shall be equipped with a spring latch on the operating lever to prevent premature or accidental tripping.

(ii) The operating levers on hand-tripped presses having more than one operating station shall be interlocked to prevent the tripping of the press except by the "concurrent" use of all levers.

(6) *Two-hand trip.* (i) A two-hand trip shall have the individual operator's hand controls protected against unintentional operation and have the individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press and use a control arrangement requiring concurrent operation of the individual operator's hand controls.

(ii) Two-hand trip systems on full revolution clutch machines shall incorporate an antirepeat feature.

(iii) If two-hand trip systems are used on multiple operator presses, each operator shall have a separate set of controls.

(7) *Machines using part revolution clutches.* (i) The clutch shall release and the brake shall be applied when the external clutch engaging means is removed, deactivated, or deenergized.

(ii) A red color stop control shall be provided with the clutch/brake control system. Momentary operation of the stop control shall immediately deactivate the clutch and apply the brake. The stop control shall override any other control, and reactuation of the clutch shall require use of the operating (tripping) means which has been selected.

(iii) A means of selecting Off, "Inch," Single Stroke, and Continuous (when the continuous function is furnished) shall be supplied with the clutch/brake control to select type of operation of the press. Fixing of selection shall be by means capable of supervision by the employer.

(iv) The "Inch" operating means shall be designed to prevent exposure of the workers hands within the point of operation by:

(*a*) Requiring the concurrent use of both hands to actuate the clutch, or

(*b*) Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operatng the single control.

(v) Two-hand controls for single stroke shall conform to the following requirements:

(*a*) Each hand control shall be protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press.

(*b*) The control system shall be designed to permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke.

(*c*) The control system shall incorporate an antirepeat feature.

(*d*) The control systems shall be designed to require release of all operators' hand controls before an interrupted stroke can be resumed. This requirement pertains only to those single-stroke, two-hand controls manufactured and installed on or after August 31, 1971.

(vi) [Reserved]

(vii) Controls for more than one operating station shall be designed to be activated and deactivated in complete sets of two operator's hand controls per operating station by means capable of being supervised by the employer. The clutch/brake control system shall be designed and constructed to prevent actuation of the clutch if all operating stations are bypassed.

(vii) Those clutch/brake control systems which contain both single and continuous functions shall be designed so that completion of continuous circuits may be supervised by the employer. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in continuous stroking.

(ix) If foot control is provided, the selection method between hand and foot control shall be separate from the stroking selector and shall be designed so that the selection may be supervised by the employer.

(x) Foot operated tripping controls, if used, shall be protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control.

(xi) The control of air-clutch machines shall be designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur. This requirement shall apply only to those clutch/brake air-valve controls manufactured and installed on or after August 31, 1971, but shall not apply to machines intended only for continuous, automatic feeding applications.

(xii) The clutch/brake control shall incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or Continuous functions unless the press drive motor is energized and in the forward direction.

(xiii) The clutch/brake control shall automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch shall require restoration of normal supply and the use of the tripping mechanism(s).

(xiv) The clutch/brake control shall automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch shall require restoration of normal air supply and use of the tripping mechanism(s).

(xv) Selection of bar operation shall be by means capable of being supervised by the employer. A separate pushbutton shall be employed to activate the clutch, and the clutch shall be activated only if the driver motor is deenergized.

(8) *Electrical.* (i) A main power disconnect switch capable of being locked only in the Off position shall be provided with every power press control system.

(ii) The motor start button shall be protected against accidental operation.

(iii) All mechanical power press controls shall incorporate a type of drive motor starter that will disconnect the drive motor from the power source in event of control voltage or power source failure, and require operation of the motor start button to restart the motor when voltage conditions are restored to normal.

(iv) All a.c. control circuits and solenoid valve coils shall be powered by not more than a nominal 240-volt d.c. supply obtained from a transformer with an isolated secondary. Higher voltages that may be necessary for operation of machine or control mechanisms shall be isolated from any control mechanism handled by the operator, but motor starters with integral Start-Stop buttons may utilize line voltage control. All d.c. control circuits shall be powered by not more than a nominal 240-volt d.c. supply isolated from any higher voltages.

(v) All clutch/brake control electrical circuits shall be protected against the possibility of an accidental ground in the control circuit causing false operation of the press.

(vi) Electrical clutch/brake control circuits shall incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches, and static output circuits.

(9) *Slide counterbalance systems.* (i) Spring counterbalance systems when used shall incorporate means to retain system parts in event of breakage.

(ii) Spring counterbalances when used shall have the capability to hold the slide and its attachments at midstroke, without brake applied.

(iii) Air counterbalance cylinders shall incorporate means to retain the piston and rod in case of breakage or loosening.

(iv) Air counterbalance cylinders shall have adequate capability to hold the slide and its attachments at any point in stroke, without brake applied.

(v) Air counterbalance cylinders shall incorporate means to prevent failure of capability (sudden loss of pressure) in event of air supply failure.

(10) *Air controlling equipment.* Air controlling equipment shall be protected against foreign material and water entering the pneumatic system of the press. A means of air lubrication shall be provided when needed.

(11) *Hydraulic equipment.* The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in that system.

(12) *Pressure vessels.* All pressure vessels used in conjunction with power presses shall conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition.

(c) *Safeguarding the point of operation*—(1) *General requirements.* (i) It shall be the responsibility of the employer to provide and insure the usage of "point of operation guards" or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press. See Table O–10.

(ii) The requirement of subdivision (i) of this subparagraph shall not apply when the point of operation opening is one-fourth inch or less. See Table O–10.

(2) *Point of operation guards.* (i) Every point of operation guard shall meet the following design, construction, application, and adjustment requirements:

(*a*) It shall prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;

(*b*) It shall conform to the maximum permissible openings of Table O–10;

(*c*) It shall, in itself, create no pinch point between the guard and moving machine parts;

(*d*) It shall utilize fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal of essential parts;

(*e*) It shall facilitate its inspection, and

(*f*) It shall offer maximum visibility of the point of operation consistent with the other requirements.

(ii) A die enclosure guard shall be attached to the die shoe or stripper in a fixed position.

(iii) A fixed barrier guard shall be attached securely to the frame of the press or to the bolster plate.

(iv) An interlocked press barrier guard shall be attached to the press frame or bolster and shall be interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position to conform to the requirements of Table O–10.

(v) With full revolution clutches, an interlocked press barrier guard shall be used only on single stroke.

(vi) The adjustable barrier guard shall be securely attached to the press bed, bolster plate, or die shoe, and shall be adjusted and operated in conformity with Table O–10 and the requirements of this subparagraph. Adjustments shall be made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O–10 and this subparagraph.

(vii) A point of operation enclosure which does not meet the requirements of this subparagraph and Table O–10 shall be used only in conjunction with point of operation devices.

(3) *Point of operation devices.* (i) Point of operation devices shall protect the operator by:

(*a*) Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation; or

(*b*) Preventing the operator from inadvertently reaching into the point of operation or withdrawing his hands if they are inadvertently located in the point of operation, as the dies close; or

(*c*) Preventing the operator from inadvertently reaching into the point of operation at all times; or

(*d*) Requiring application of both of the operator's hands to machine operating controls during the die closing portion of the press stroke; or

(*e*) Locating single cycle operating controls so that the slide completes its downward travel before the operator's hands can inadvertently reach into the point of operation.

(ii) The gate or movable barrier device shall protect the operator in accordance with subdivision (i) (*a*) of this subparagraph, and shall enclose the point of operation before the press clutch can be actuated.

(*a*) When used with a power press having a full revolution clutch the device shall be operated only with a single-stroke mechanism, and shall be so applied as to make impossible any attempt, after tripping the clutch, to open the device and reach into the point of operation prior to die closure.

(*b*) When used with a part revolution clutch the device shall be interlocked into the clutch/brake control system to prevent or stop activation of the clutch unless the device is in its closed (protecting) position.

(iii) The presence sensing point of operation device shall protect the operator as provided in subdivision (i)(*a*) of this subparagraph and shall be interlocked into the clutch/brake control circuit to prevent or stop clutch activation and apply the brake if an operator's hand or other part of his body is detected in the sensing field of the device.

(*a*) The device shall not in itself create any hazard to the operator.

(*b*) The device shall not be used on machines using full revolution clutches.

(*c*) The device shall not be used as a tripping mechanism.

(*d*) The device shall be designed for failsafe.

(iv) The pull-out device shall protect the operator as specified in subdivision (i)(*b*) of this subparagraph, and shall include attachments for each of the operator's hands. Such attachments shall be connected to and operated only by the press slide or upper die, and shall be adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close. A separate pull-out device shall be provided for each operator if more than one operator is required on a press.

(v) The sweep device shall protect the operator as specified in subdivision (i)(*b*) of this subparagraph, by moving his hands safely to a safe position if they are inadvertently in the point of operation as the dies close or prior to tripping the clutch. Devices operating in this manner shall have a barrier attached to the sweep arm in such a manner as to prevent the operator from reaching into the point of operation past the trailing edge of the sweep arm on the downward stroke of the press.

(*a*) The sweep device shall be activated by the slide or by motion of a foot pedal triprod.

(*b*) The sweep device shall be designed, installed and operated so as to prevent the operator from reaching into the point of operation before the dies close.

(*c*) The sweep device shall be installed so that it will not itself create an impact or shear hazard between the sweep arm and the press tie rods, dies, or any other part of the press or barrier.

(*d*) Partial enclosures conforming with this subparagraph insofar as the area of entry which they protect shall be provided on both sides of the point of operation to prevent the operator from reaching around or behind the sweep device and into the point of operation after the dies start to close. Side partial enclosures shall not themselves create a pinch point or shear hazard.

(vi) A holdout or a restraint device shall protect the operator as specified in subdivision (i)(*c*) of this subparagraph and shall include attachments for each of the operator's hands. Such attachments shall be securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation. A separate set of restraints shall be provided for each operator if more than one operator is required on a press.

(vii) The two-hand control devices shall protect the operator as specified in subdivision (i)(*d*) of this subparagraph. In press operations requiring more than one operator, separate two-hand controls shall be provided for each operator.

(viii) The two-hand trip shall protect the operator as specified in subdivision (i)(*e*) of this subparagraph. When a two-hand trip is used as a point of operation device it shall meet the construction requirements of paragraph (b)(6) of this section.

(ix) Two-hand tripping devices used with full revolution clutches shall be considered as a point of operation device only when installed on presses of high speed, short stroke, or by having these control mechanisms mounted at a distance away from the point of operation so as to insure that the operator cannot inadvertently reach into the point of operation after tripping the clutch and at any time prior to die closure.

(4) *Hand feeding tools.* Hand feeding tools are intended for placing and removing materials in and from the press. Hand feeding tools are not a point of operation guard or protection device and shall not be used in lieu of the "guards" or devices required in this section.

(d) *Design, construction, setting, and feeding of dies*—(1) *General requirements.* It shall be the responsibility of the employer to institute die procurement, construction and modification policies and procedures that will eliminate by August 31, 1974, the need for the operator to place his hands or fingers within the point of operation. Effective August 31, 1974, the employer shall:

(i) Use dies designed and constructed to eliminate hazards to operating personnel.

(ii) Furnish and enforce the use of a handtool specifically designed for the purpose of freeing and/or removing stuck work or scrap pieces from the die to avoid requiring the operator to place his hands or fingers within the point of operation, and

(iii) Furnish and enforce the use of hand feeding tools when necessary with manual feeding methods to avoid requiring the operator to place his hands or fingers within the point of operation.

(2) *Ejecting stock and scrap.* (i) Dies shall be designed to permit use of press knockouts and lower liftouts where the press is so equipped.

(ii) Spring or rubber strippers or an equivalent means shall be provided on punching or piercing dies, to prevent material from riding up with the punch, except where a special mechanism is provided for scrap ejection. Dies should be designed to allow automatic ejection of stock and scrap.

(3) *Scrap handling.* The employer shall provide means for handling scrap from roll feed or random length stock operations. Scrap cutters used in conjunction with scrap handling systems shall be safeguarded in accordance with paragraph (b) of this section and with § 1910.219.

(4) *Guide post hazard.* The hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than one-fourth inch shall be considered as a point of operation hazard and be protected in accordance with paragraph (c) of this section.

(5) *Unitized tooling.* If unitized tooling is used, the opening between the top of the punch holder and the face of the slide, or striking pad, shall be safeguarded in accordance with the requirements of paragraph (b) of this section.

(6) *Tonnage, stroke, and weight designation.* All dies shall be:

(i) Stamped with the tonnage and stroke requirements, or have these characteristics recorded if these records are readily available to the die setter;

(ii) Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment; and

(iii) Stamped to indicate complete die weight when handling equipment may become overloaded.

(7) *Die fastening.* Provision shall be made in both the upper and lower shoes for securely mounting the die to the bolster and slide. Where clamp caps or setscrews are used in conjunction with punch stems, additional means of securing the upper shoe to the slide shall be used.

(8) *Die handling.* Handling equipment attach points shall be provided on all dies requiring mechanical handling.

(9) *Diesetting.* (i) The employer shall establish a diesetting procedure that will insure compliance with paragraph (b) of this section.

(ii) The employer shall provide spring loaded turnover bars, for presses designed to accept such turnover bars.

(iii) The employer shall provide die stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.

(iv) The employer shall provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.

(v) The employer shall provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns so that operators and diesetters shall not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

(e) *Inspection, maintenance, and modification of presses*—(1) *Inspection and maintenance records.* It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspections of his power presses to insure that all their parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment. The employer shall maintain records of these inspections and the maintenance work performed.

(2) *Modification.* It shall be the responsibility of any person modifying a power press to furnish instructions with the modification to establish new or changed guidelines for use and care of the power press so modified.

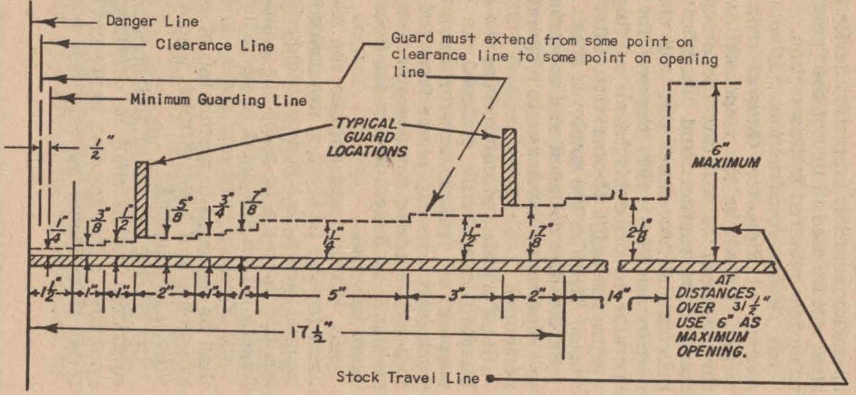
(3) *Training of maintenance personnel.* It shall be the responsibility of the employer to insure the original and continuing competence of personnel caring for, inspecting, and maintaining power presses.

(f) *Operation of power presses*—(1) *Employment of minors.* The employer shall permit no one under 18 years of age to operate or assist in the operation of machinery covered in this section.

(2) *Instruction to operators.* The employer shall train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer shall insure by adequate supervision that correct operating procedures are being followed.

(3) *Work area.* The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. Ample room for cleaning machines, handling material, work pieces, and scrap shall also be provided. All surrounding floors shall be kept in good condition and free from obstructions, grease, oil, and water.

(4) *Overloading.* The employer shall operate his presses within the tonnage and attachment weight ratings specified by the manufacturer.



Explanation of above diagram:

This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The *clearance line* marks the distance required to prevent contact between guard and moving parts.

The *minimum guarding line* is the distance between the infeed side of the guard and the danger line which is one-half inch from the danger line.

The various openings are such that for average size hands an operator's fingers won't reach the point of operation.

After installation of point of operation guards and before a job is released for operation a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.

TABLE O-10

Distance of opening from point of operation hazard (inches)	*Maximum width of opening (inches)*
½ to 1½	¼
1½ to 2½	⅜
2½ to 3½	½
3½ to 5½	⅝
5½ to 6½	¾
6½ to 7½	⅞
7½ to 12½	1¼
12½ to 15½	1½
15½ to 17½	1⅞
17½ to 31½	2⅛

This table shows the distances that guards shall be positioned from the danger line in accordance with the required openings.

§ 1910.218 Forging machines.

(a) *General requirements*—(1) *Use of lead.* The safety requirements of this subparagraph apply to lead casts or other use of lead in the forge shop or die shop.

(i) Thermostatic control of heating elements shall be provided to maintain proper melting temperature and prevent overheating.

(ii) Fixed or permanent lead pot installations shall be exhausted.

(iii) Portable units shall be used only in areas where good, general room ventilation is provided.

(iv) Personal protective equipment (gloves, goggles, aprons, and other items) shall be worn.

(v) A covered container shall be provided to store dross skimmings.

(vi) Equipment shall be kept clean, particularly from accumulations of yellow lead oxide.

(2) *Inspection and maintenance.* It shall be the responsibility of the employer to maintain all forge shop equipment in a condition which will insure continued safe operation. This responsibility includes:

(i) Establishing periodic and regular maintenance safety checks and keeping records of these inspections.

(ii) Scheduling and recording inspection of guards and point of operation protection devices at frequent and regular intervals.

(iii) Training personnel for the proper inspection and maintenance of forging machinery and equipment.

(iv) All overhead parts shall be fastened or protected in such a manner that they will not fly off or fall in event of failure.

(3) *Hammers and presses.* (i) All hammers shall be positioned or installed in such a manner that they remain on or are anchored to foundations sufficient to support them according to applicable engineering standards.

(ii) All presses shall be installed in such a manner that they remain where they are positioned or they are anchored to foundations sufficient to support them according to applicable engineering standards.

(iii) Means shall be provided for disconnecting the power to the machine and for locking out or rendering cycling controls inoperable.

(iv) The ram shall be blocked when dies are being changed or other work is being done on the hammer. Blocks or wedges shall be made of material the strength and construction of which should meet or exceed the specifications and dimensions shown in Table O-11.

TABLE O-11—STRENGTH AND DIMENSIONS FOR WOOD RAM PROPS

Size of timber, inches [1]	Square inches in cross section	Minimum allowable crushing strength parallel to grain, p.s.i.[2]	Maximum static load within short column range [3]	Safety factor	Maximum recommended weight of forging hammer for timber used	Maximum allowable length of timber, inches
4 x 4	16	5,000	80,000	10	8,000	44
6 x 6	36	5,000	180,000	10	18,000	66
8 x 8	64	5,000	320,000	10	32,000	88
10 x 10	100	5,000	500,000	10	50,000	100
12 x 12	144	5,000	720,000	10	72,000	132

[1] Actual dimension.

[2] Adapted from U.S. Department of Agriculture Technical Bulletin 479. Hardwoods recommended are those whose ultimate crushing strengths in compression parallel to grain are 5,000 p.s.i. (pounds per square inch) or greater.

[3] Slenderness ratio formula for short columns is $L/d=11$, where L=length of timber in inches and d=least dimension in inches; this ratio should not exceed 11.

(v) Tongs shall be of sufficient length to clear the body of the worker in case of kickback, and shall not have sharp handle ends. The worker should be instructed in the proper body position when using tongs. Tongs should be checked periodically to see that they remain at the proper hardness level for the job. When rings or equivalent devices for locking tongs are used they should be inspected periodically to insure safe condition.

(vi) Oil swabs, or scale removers, or other devices to remove scale shall be provided. These devices shall be long enough to enable a man to reach the full length of the die without placing his hand or arm between the dies.

(vii) Material handling equipment shall be of adequate strength, size, and dimension to handle diesetting operations safely.

(viii) A scale guard of substantial construction shall be provided at the back of every hammer, so arranged as to stop flying scale.

(ix) A scale guard of substantial construction shall be provided at the back of every press, so arranged as to stop flying scale.

(b) *Hammers, general*—(1) *Keys.* Die keys and shims shall be made from a grade of material that will not unduly crack or splinter, and should not project more than 2 inches in front and 4 inches in back of ram or die.

(2) *Foot operated devices.* All foot operated devices (i.e., treadles, pedals, bars, valves, and switches) shall be substantially and effectively protected from unintended operation.

(c) *Presses.* All manually operated valves and switches shall be clearly identified and readily accessible.

(d) *Power-driven hammers*—(1) *Safety cylinder head.* Every steam or airhammer shall have a safety cylinder head to act as a cushion if the rod should break or pullout of the ram.

(2) *Shutoff valve.* Steam hammers shall be provided with a quick closing emergency valve in the admission pipeline at a convenient location. This valve shall be closed and locked in the off position while the hammer is being adjusted, repaired, or serviced, or when the dies are being changed.

(3) *Cylinder draining.* Steam hammers shall be provided with a means of cylinder draining, such as a self-draining arrangement or a quick-acting drain cock.

(4) *Pressure pipes.* Steam or air piping shall conform to the specifications of American National Standard ANSI B31.1.0–1967, Power Piping with Addenda issued before April 28, 1971.

(e) *Gravity hammers*—(1) *Air-lift hammers.* (i) Air-lift hammers shall have a safety cylinder head as required in paragraph (d)(1) of this section.

(ii) Air-lift hammers shall have an air shutoff valve as required in paragraph (d)(2) of this section and should be conveniently located and distinctly marked for ease of identification.

(iii) Air-lift hammers shall be provided with two drain cocks: one on main head cylinder, and one on clamp cylinder.

(iv) Air piping shall conform to the specifications of the ANSI B31.1.0–1967, Power Piping with Addenda issued before April 28, 1971.

(2) *Board drophammers.* (i) A suitable enclosure shall be provided to prevent damaged or detached boards from falling. The board enclosure shall be securely fastened to the hammer.

(ii) All major assemblies and fittings which can loosen and fall shall be properly secured in place.

(f) *Forging presses*—(1) *Mechanical forging presses.* When dies are being changed or maintenance is being performed on the press, the following shall be accomplished:

(i) The power to the press shall be locked out.

(ii) The flywheel shall be at rest.

(iii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table O–11.

(2) *Hydraulic forging presses.* When dies are being changed or maintenance is being performed on the press, the following shall be accomplished:

(i) The hydraulic pumps and power apparatus shall be locked out.

(ii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table O–11.

(g) *Trimming presses*—(1) *Hot trimming presses.* The requirements of paragraph (f)(1) of this section shall also apply to hot trimming presses.

(2) *Cold trimming presses.* Cold trimming presses shall be safeguarded in accordance with § 1910.217(c).

(h) *Upsetters*—(1) *General requirements.* All upsetters shall be installed so that they remain on their supporting foundations.

(2) *Lockouts.* Upsetters shall be provided with a means for locking out the power at its entry point to the machine and rendering its cycling controls inoperable.

(3) *Manually operated controls.* All manually operated valves and switches shall be clearly identified and readily accessible.

(4) *Tongs.* Tongs shall be of sufficient length to clear the body of the worker in case of kickback, and shall not have sharp handle ends. The worker should be instructed in the proper body position when using tongs. Tongs should be checked periodically to see that they remain at the proper hardness level for the job. When rings or equivalent devices for locking tongs are used they should be inspected periodically to ensure safe condition.

(5) *Changing dies.* When dies are being changed, maintenance performed, or any work done on the machine, the power to the upsetter shall be locked out, and the flywheel shall be at rest.

(i) *Other forging equipment*—(1) *Boltheading.* The provisions of paragraph (h) of this section shall apply to boltheading.

(2) *Rivet making.* The provisions of paragraph (h) of this section shall apply to rivet making.

(j) *Other forge facility equipment*—(1) *Billet shears.* A positive-type lockout device for disconnecting the power to the shear shall be provided.

(2) *Saws.* Every saw shall be provided with a guard of not less than one-eighth inch sheet metal positioned to stop flying sparks. Suitable means should be provided to trap sparks below the saw. A tank of water placed below the saw is also desirable.

(3) *Conveyors.* Conveyor power transmission equipment shall be guarded in accordance with ANSI B20.1–1957, Safety Code for Conveyors, Cableways, and Related Equipment.

(4) *Shot blast.* The cleaning chamber shall have doors or guards to protect operators.

(5) *Grinding.* Personal protective equipment shall be used in grinding operations, and equipment shall be used and maintained in accordance with ANSI B7.1–1970, Safety Code for the Use, Care, and Protection of Abrasive Wheels, and with § 1910.215.

§ 1910.219 Mechanical power-transmission apparatus.

(a) *General requirements.* (1) This section covers all types and shapes of power-transmission belts, except the following when operating at two hundred and fifty (250) feet per minute or less: (i) Flat belts one (1) inch or less in width, (ii) flat belts two (2) inches or less in width which are free from metal lacings or fasteners, (iii) round belts one-half ($\frac{1}{2}$) inch or less in diameter; and (iv) single strand V-belts, the width of which is thirteen thirty-seconds ($\frac{13}{32}$) inch or less.

(2) Vertical and inclined belts (paragraphs (e) (3) and (4) of this section) if not more than two and one-half ($2\frac{1}{2}$) inches wide and running at a speed of less than one thousand (1,000) feet per minute, and if free from metal lacings or fastenings may be guarded with a nip-point belt and pulley guard.

(3) For the Textile Industry, because of the presence of excessive deposits of lint, which constitute a serious fire hazard, the sides and face sections only of nip-point belt and pulley guards are required, provided the guard shall extend at least six (6) inches beyond the rim of the pulley on the in-running and off-running sides of the belt and at least two (2) inches away from the rim and face of the pulley in all other directions.

(4) This section covers the principal features with which power transmission safeguards shall comply.

(b) *Prime-mover guards*—(1) *Flywheels.* Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in accordance with the requirements of this subparagraph:

(i) With an enclosure of sheet, perforated, or expanded metal, or woven wire;

(ii) With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within 12 inches of floor, a standard toeboard shall also be provided;

(iii) When the upper rim of flywheel protrudes through a working floor, it shall be entirely enclosed or surrounded by a guardrail and toeboard.

(iv) For flywheels with smooth rims five (5) feet or less in diameter, where the preceding methods cannot be applied, the following may be used: A disk attached to the flywheel in such manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection. An open space, not exceeding four (4) inches in width, may be left between the outside edge of the disk and the rim of the wheel if desired, to facilitate turning the wheel over. Where a disk is used, the keys or other dangerous projections not covered by disk shall be cut off or covered. This subdivision does not apply to flywheels with solid web centers.

(v) Adjustable guard to be used for starting engine or for running adjustment may be provided at the flywheel of gas or oil engines. A slot opening for jack bar will be permitted.

(vi) Wherever flywheels are above working areas, guards shall be installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure.

(2) *Cranks and connecting rods.* Cranks and connecting rods, when exposed to contact, shall be guarded in accordance with paragraphs (m) and (n) of this section, or by a guardrail as described in paragraph (o)(5) of this section.

(3) *Tail rods or extension piston rods.* Tail rods or extension piston rods shall be guarded in accordance with paragraphs (m) and (o) of this section, or by a guardrail on sides and end, with a clearance of not less than fifteen (15) nor more than twenty (20) inches when rod is fully extended.

(4) *Governor balls.* Governor balls six (6) feet or less from the floor or other working level, when exposed to contact, shall be provided with an enclosure extending to the top of the governor balls when at their highest position. The material used in the construction of this enclosure shall conform to paragraphs (m) and (o) of this section.

(c) *Shafting*—(1) *Installation.* (i) Each continuous line of shafting shall be secured in position against excessive endwise movement.

(ii) Inclined and vertical shafts, particularly inclined idler shafts, shall be securely held in position against endwise thrust.

(2) *Guarding horizontal shafting.* (i) All exposed parts of horizontal shafting seven (7) feet or less from floor or working platform, excepting runways used exclusively for oiling, or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as location requires.

(ii) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires. The sides of the trough shall come within at least six (6) inches of the underside of table, or if shafting is located near floor within six (6) inches of floor. In every case the sides of trough shall extend at least two (2) inches beyond the shafting or protuberance.

(3) *Guarding vertical and inclined shafting.* Vertical and inclined shafting seven (7) feet or less from floor or working platform, excepting maintenance runways, shall be enclosed with a stationary casing in accordance with requirements of paragraphs (m) and (o) of this section.

(4) *Projecting shaft ends.* (i) Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by nonrotating caps or safety sleeves.

(ii) Unused keyways shall be filled up or covered.

(5) *Power-transmission apparatus located in basements.* All mechanical power transmission apparatus located in basements, towers, and rooms used exclusively for power transmission equipment shall be guarded in accordance with this section, except that the requirements for safeguarding belts, pulleys, and shafting need not be complied with when the following requirements are met:

(i) The basement, tower, or room occupied by transmission equipment is locked against unauthorized entrance.

(ii) The vertical clearance in passageways between the floor and power transmission beams, ceiling, or any other objects, is not less than five feet six inches (5 ft. 6 in.).

(iii) The intensity of illumination conforms to the requirements of ANSI A11.1–1965 (R–1970).

(iv) The footing is dry, firm, and level.

(v) The route followed by the oiler is protected in such manner as to prevent accident.

(d) *Pulleys*—(1) *Guarding.* Pulleys, any parts of which are seven (7) feet or less from the floor or working platform, shall be guarded in accordance with the standards specified in paragraphs (m) and (o) of this section. Pulleys serving as balance wheels (e.g., punch presses) on which the point of contact between belt and pulley is more than six feet six inches (6 ft. 6 in.) from the floor or platform may be guarded with a disk covering the spokes.

(2) *Location of pulleys.* (i) Unless the distance to the nearest fixed pulley, clutch, or hanger exceeds the width of the belt used, a guide shall be provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists.

(ii) Where there are overhanging pulleys on line, jack, or countershafts with no bearing between the pulley and the outer end of the shaft, a guide to prevent the belt from running off the pulley should be provided.

(3) *Broken pulleys.* Pulleys with cracks, or pieces broken out of rims, shall not be used.

(4) *Pulley speeds.* Pulleys intended to operate at rim speed in excess of manufacturers normal recommendations shall be specially designed and carefully balanced for the speed at which they are to operate.

(5) *Composition and wood pulleys.* Composition or laminated wood pulleys shall not be installed where they are subjected to influences detrimental to their structural composition.

(e) *Belt, rope, and chain drives*—(1) *Horizontal belts and ropes.* (i) Where both runs of horizontal belts are seven (7) feet or less from the floor level, the guard shall extend to at least fifteen (15) inches above the belt or to a standard height (see Table O–12), except that where both runs of a horizontal belt are 42 inches or less from the floor, the belt shall be fully enclosed in accordance with paragraphs (m) and (o) of this section.

(ii) In powerplants or power-development rooms, a guardrail may be used in lieu of the guard required by subdivision (i) of this subparagraph.

(2) *Overhead horizontal belts.* (i) Overhead horizontal belts, with lower parts seven (7) feet or less from the floor or platform, shall be guarded on sides and bottom in accordance with paragraph (o)(3) of this section.

(ii) Horizontal overhead belts more than seven (7) feet above floor or platform shall be guarded for their entire length under the following conditions:

(*a*) If located over passageways or work places and traveling 1,800 feet or more per minute.

(*b*) If center to center distance between pulleys is ten (10) feet or more.

(*c*) If belt is eight (8) inches or more in width.

(iii) Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be possible, the passage shall be either:

(*a*) Completely barred by a guardrail or other barrier in accordance with paragraphs (m) and (o) of this section; or

(*b*) Where passage is regarded as necessary, there shall be a platform over the lower run guarded on either side by a railing completely filled in with wire mesh or other filler, or by a solid barrier. The upper run shall be so guarded as to prevent contact therewith either by the worker or by objects carried by him. In powerplants only the lower run of the belt need be guarded.

(iv) Overhead chain and link belt drives are governed by the same rules as overhead horizontal belts and shall be guarded in the same manner as belts.

(v) American or Continuous System rope drives so located that the condition of the rope (particularly the splice) cannot be constantly and conveniently observed, shall be equipped with a telltale device (preferably electric-bell type) that will give warning when rope begins to fray.

(3) *Vertical and inclined belts.* (i) Vertical and inclined belts shall be enclosed by a guard conforming to standards in paragraphs (m) and (o) of this section.

(ii) All guards for inclined belts shall be arranged in such a manner that a minimum clearance of seven (7) feet is maintained between belt and floor at any point outside of guard.

(4) *Vertical belts.* Vertical belts running over a lower pulley more than seven (7) feet above floor or platform shall be guarded at the bottom in the same manner as horizontal overhead belts, if conditions are as stated in subparagraphs (2)(ii) (*a*) and (*c*) of this paragraph.

(5) *Cone-pulley belts.* (i) The cone belt and pulley shall be equipped with a belt shifter so constructed as to adequately guard the nip point of the belt and pulley. If the frame of the belt shifter does not adequately guard the nip point of the belt and pulley, the nip point shall be further protected by means of a vertical guard placed in front

of the pulley and extending at least to the top of the largest step of the cone.

(ii) If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, the belt will be considered guarded if the nip point of the belt and pulley is protected by a nip point guard located in front of the cone extending at least to the top of the largest step of the cone, and formed to show the contour of the cone in order to give the nip point of the belt and pulley the maximum protection.

(iii) If the cone is located less than 3 feet from the floor or working platform, the cone pulley and belt shall be guarded to a height of 3 feet regardless of whether the belt is endless or laced with rawhide.

(6) *Belt tighteners.* (i) Suspended counterbalanced tighteners and all parts thereof shall be of substantial construction and securely fastened; the bearings shall be securely capped. Means must be provided to prevent tightener from falling, in case the belt breaks.

(ii) Where suspended counterweights are used and not guarded by location, they shall be so encased as to prevent accident.

(f) *Gears, sprockets, and chains*—(1) *Gears.* Gears shall be guarded in accordance with one of the following methods:

(i) By a complete enclosure; or

(ii) By a standard guard as described in paragraph (o) of this section, at least seven (7) feet high extending six (6) inches above the mesh point of the gears; or

(iii) By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than six (6) feet from the floor a disk guard or a complete enclosure to the height of six (6) feet shall be required.

(2) *Hand-operated gears.* Subparagraph (1) of this paragraph does not apply to hand-operated gears used only to adjust machine parts and which do not continue to move after hand power is removed. However, the guarding of these gears is highly recommended.

(3) *Sprockets and chains.* All sprocket wheels and chains shall be enclosed unless they are more than seven (7) feet above the floor or platform. Where the drive extends over other machine or working areas, protection against falling shall be provided. This subparagraph does not apply to manually operated sprockets.

(4) *Openings for oiling.* When frequent oiling must be done, openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil feed tubes if lubricant is to be added while machinery is in motion.

(g) *Guarding friction drives.* The driving point of all friction drives when exposed to contact shall be guarded, all arm or spoke friction drives and all web friction drives with holes in the web shall be entirely enclosed, and all projecting belts on friction drives where exposed to contact shall be guarded.

(h) *Keys, setscrews, and other projections.* (1) All projecting keys, setscrews, and other projections in revolving parts shall be removed or made flush or guarded by metal cover. This subparagraph does not apply to keys or setscrews within gear or sprocket casings or other enclosures, nor to keys, setscrews, or oilcups in hubs of pulleys less than twenty (20) inches in diameter where they are within the plane of the rim of the pulley.

(2) It is recommended, however, that no projecting setscrews or oilcups be used in any revolving pulley or part of machinery.

(i) *Collars and couplings*—(1) *Collars.* All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

(2) *Couplings.* Shaft couplings shall be so constructed as to present no hazard from bolts, nuts, setscrews, or revolving surfaces. Bolts, nuts, and setscrews will, however, be permitted where they are covered with safety sleeves or where they are used parallel with the shafting and are countersunk or else do not extend beyond the flange of the coupling.

(j) *Bearings and facilities for oiling.* Self lubricating bearings are recommended and all drip cups and pans shall be securely fastened.

(k) *Guarding of clutches, cutoff couplings, and clutch pulleys*—(1) *Guards.* Clutches, cutoff couplings, or clutch pulleys having projecting parts, where such clutches are located seven (7) feet or less above the floor or working platform, shall be enclosed by a stationary guard constructed in accordance with this section. A "U" type guard is permissible.

(2) *Engine rooms.* In engine rooms a guardrail, preferably with toeboard, may be used instead of the guard required by subparagraph (1) of this paragraph, provided such a room is occupied only by engine room attendants.

(3) *Bearings.* A bearing support immediately adjacent to a friction clutch or cutoff coupling shall have self-lubricating bearings requiring attention at infrequent intervals.

(l) *Belt shifters, clutches, shippers, poles, perches, and fasteners*—(1) *Belt shifters.* (i) Tight and loose pulleys on all new installations made on or after August 31, 1971, shall be equipped with a permanent belt shifter provided with mechanical means to prevent belt from creeping from loose to tight pulley. It is recommended that old installations be changed to conform to this rule.

(ii) Belt shifter and clutch handles shall be rounded and be located as far as possible from danger of accidental contact, but within easy reach of the operator. Where belt shifters are not directly located over a machine or bench, the handles shall be cut off six feet six inches (6 ft. 6 in.) above floor level.

(iii) All belt and clutch shifters of the same type in each shop should move in the same direction to stop machines, i.e., either all right or all left. This does not apply to friction clutch on countershaft carrying two clutch pulleys with open and crossed belts, respectively. In this case the shifter handle has three positions and the machine is at a standstill when clutch handle is in the neutral or center position.

(2) *Belt shippers and shipper poles.* The use of belt poles as substitutes for mechanical shifters is not recommended. Where necessity compels their use, they shall be of sufficient size to enable workmen to grasp them securely. (A two-inch (2 in.) diameter or 1½ by 2 inches cross-section is suggested.) Poles shall be smooth and preferably of straight grain hardwood, such as ash or hickory. The edges of rectangular poles should be rounded. Poles should extend from the top of the pulley to within about forty (40) inches of floor or working platform.

(3) *Belt perches.* Where loose pulleys or idlers are not practicable, belt perches in form of brackets, rollers, etc., shall be used to keep idle belts away from the shafts. Perches should be substantial and designed for the safe shifting of belts.

(4) *Belt fasteners.* Belts which of necessity must be shifted by hand and belts within seven (7) feet of the floor or working platform which are not guarded in accordance with this section shall not be fastened with metal in any case, nor with any other fastening which by construction or wear will constitute an accident hazard.

(m) *Standard guards—general requirements*—(1) *Materials.* (i) Standard conditions shall be secured by the use of the following materials. Expanded metal, perforated or solid sheet metal, wire mesh on a frame of angle iron, or iron pipe securely fastened to floor or to frame of machine.

(ii) All metal should be free from burrs and sharp edges.

(iii) Wire mesh should be of the type in which the wires are securely fastened at every cross point either by welding, soldering, or galvanizing, except in case of diamond or square wire mesh made of No. 14 gage wire. ¾-inch mesh or heavier

(2) *Methods of manufacture.* (i) Expanded metal, sheet or perforated metal, and wire mesh shall be securely fastened to frame by one of the following methods:

(*a*) With rivets or bolts spaced not more than five (5) inches center to center. In case of expanded metal or wire mesh, metal strips or clips shall be used to form a washer for rivets or bolts.

(*b*) by welding to frame every four (4) inches.

(*c*) By weaving through channel or angle frame, or if No. 14 gage ¾-inch mesh or heavier is used by bending entirely around rod frames.

(*d*) Where openings in pipe railing are to be filled in with expanded metal, wire mesh or sheet metal, the filler material shall be made into panels with rolled edges or bound with "V" or "U" edging of No. 24 gage or heavier sheet metal fastened to the panels with bolts or rivets spaced not more than five (5) inches center to center. The bound panels shall be fastened to the railing by sheet-metal clips spaced not more than five (5) inches center to center.

(*e*) Diamond or square mesh made of crimped wire fastened into channels, angle or round-iron frames, may also be used as a filler in guards. Size of mesh shall correspond to Table O–12.

(ii) Where the design of guards requires filler material of greater area than 12 square feet, additional frame members shall be provided to maintain panel area within this limit.

(iii) All joints of framework shall be made equivalent in strength to the material of the frame.

(n) *Disk, shield, and "U" guards*—(1) *Disk guards.* A disk guard shall consist of a sheet-metal disk not less than No. 22 gage fastened by "U" bolts or rivets to spokes of pulleys, flywheels, or gears. Where possibility of contact with sharp edges of the disk exists, the edge shall be rolled or wired. In all cases the nuts shall be provided with locknuts which shall be placed on the unexposed side of the wheel.

(2) *Shield guards.* (i) A shield guard shall consist of a frame filled in with wire mesh, expanded, perforated, or solid sheet metal.

(ii) If area of shield does not exceed six (6) square feet the wire mesh or expanded metal may be fastened in a framework of ⅜-inch solid rod, ¾-inch by ¾-inch by ⅛-inch angle iron or metal construction of equivalent strength. Metal shields may have edges entirely rolled around a ⅜-inch solid iron rod.

(3) *"U" guards.* A "U" guard consisting of a flat surface with edge members shall be designed to cover the under surface and lower edge of a belt, multiple chain, or rope drive. It shall be constructed of materials specified in Table O–12, and shall conform to the requirements of paragraphs (o) (3) and (4) of this section. Edges shall be smooth and, if size of guard requires, these edges shall be reinforced by rolling, wiring, or by binding with angle or flat iron.

(o) *Approved materials*—(1) *Minimum requirements.* The materials and dimensions specified in this paragraph shall apply to all guards, except horizontal overhead belts, rope, cable, or chain guards more than seven (7) feet above floor, or platform. (For the latter, see Table O–13.)

TABLE O–12—TABLE OF STANDARD MATERIALS AND DIMENSIONS

Material	Clearance from moving part at all points	Largest mesh or opening allowable	Minimum gauge (U.S. Standard) or thickness	Minimum height of guard from floor or platform level
	Inches	*Inches*		*Feet*
Woven wire	Under 2	⅜	No. 16	7
	2–4	½	No. 16	7
	Under 4	½	No. 16	7
	4–15	2	No. 12	7
Expanded metal	Under 4	½	No. 18	7
	4–15	2	No. 13	7
Perforated metal	Under 4	½	No. 20	7
	4–15	2	No. 14	7
Sheet metal	Under 4		No. 22	7
	4–15		No. 22	7
Wood or metal strip crossed	Under 4	⅜	Wood ¾ Metal No. 16	7
	4–15	2	Wood ¾ Metal No. 16	7
Wood or metal strip not crossed	Under 4	½ width	Wood ¾ Meatl No. 16	7
	4–15	1 width	Wood ¾ Metal No. 16	7
Standard rail	Min. 15			
	Max. 20			

(i) Minimum dimensions of materials for the framework of all guards, except as noted in subdivision (i) (*c*) shall be angle iron 1 inch by 1 inch by ⅛ inch, metal pipe of ¾-inch inside diameter or metal construction of equivalent strength.

(*a*) All guards shall be rigidly braced every three (3) feet or fractional part of their height to some fixed part of machinery or building structure. Where guard is exposed to contact with moving equipment additional strength may be necessary.

(*b*) The framework for all guards fastened to floor or working platform and without other support or bracing shall consist of 1½-inch by 1½-inch by ⅛-inch angle iron, metal pipe of 1½-inch inside diameter, or metal construction of equivalent strength. All rectangular guards shall have at least four upright frame members each of which shall be carried to the floor and be securely fastened thereto. Cylindrical guards shall have at least three supporting members carried to floor.

(*c*) Guards thirty (30) inches or less in height and with a total surface area not in excess of ten (10) square feet may have a framework of ⅜-inch solid rod, ¾-inch by ¾-inch by ⅛-inch angle, or metal construction of equivalent strength. The filling material shall correspond to the requirements of Table O–12.

(ii) The specifications given in Table O–12 and subdivision (i) of this subparagraph are minimum requirements; where guards are exposed to unusual wear, deterioration or impact, heavier material and construction should be used to protect amply against the specific hazards involved.

(2) *Wood guards.* (i) Wood guards may be used in the woodworking and chemical industries, in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards; also in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable. In all other industries, wood guards shall not be used.

(ii) (*a*) Wood shall be sound, tough, and free from any loose knots.

(*b*) Guards shall be made of planed lumber not less than one (1) inch rough board measure, and edges and corners rounded off.

(*c*) Wood guards shall be securely fastened together with wood screws, hardwood dowel pins, bolts, or rivets.

(*d*) While no definite dimensions are given under this heading for framework or filler materials, wood guards shall be equal in strength and rigidity to metal guards specified in subparagraphs (1) (i) and (ii) of this paragraph and Table O–12.

(*e*) For construction of standard wood railing, see subpargraph (5) of this paragraph.

(3) *Guards for horizontal overhead belts.* (i) Guards for horizontal overhead belts shall run the entire length of the belt and follow the line of the pulley to the ceiling or be carried to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to wall or ceiling, construction of guard shall be such as to enclose completely the top and bottom runs of belt and the face of pulleys.

(ii) The guard and all its supporting members shall be securely fastened to wall or ceiling by gimlet-point lag screws or through bolts. In case of masonry construction, expansion bolts shall be used. The use of bolts placed horizontally through floor beams or ceiling rafters is recommended.

(iii) Suitable reinforcement shall be provided for the ceiling rafters or overhead floor beams, where such is necessary, to sustain safely the weight and stress likely to be imposed by the guard. The interior surface of all guards, by which is meant the surface of the guard with which a belt will come in contact, shall be smooth and free from all projections of any character, except where construction demands it; protruding shallow roundhead rivets may be used. Overhead belt guards shall be at least one-quarter wider than belt which they protect, except that this clearance need not in any case exceed six (6) inches on each side. Overhead rope drive and block and roller-chain-drive guards shall be not less than six (6) inches wider than the drive on each side. In overhead silent chain-drive guards where the chain is held from lateral displacement on the sprockets, the side clearances required on drives of twenty (20) inch centers or under shall be not less than one-fourth inch from the nearest moving chain part, and on drives of over twenty (20) inch centers a minimum of one-half inch from the nearest moving chain part.

(iv) Table O–13 gives the sizes of materials to be used and the general construction specifications of guards for belts ten (10) inches or more in width. No material for overhead belt guards should be smaller than that specified in Table O–13 for belts ten (10) to fourteen (14) inches wide, even if the overhead belt is less than ten (10) inches in width. However, No. 20 gage sheet metal may be used as a filler on guards for belts less than ten (10) inches wide. Expanded metal, because of the sharp edges, should not be used as a filler in horizontal belt guards.

(v) For clearance between guards and belts, ropes or chains of various center to center dimensions between the shafts, see bottom of Table O-13.

(4) *Guards for horizontal overhead rope and chain drives.* Overhead-rope and chain-drive guard construction shall conform to the rules for overhead-belt guard construction of similar width, except that the filler material shall be of the solid type as shown in Table O-13, unless the fire hazard demands the use of open construction. A side guard member of the same solid filling material should be carried up in a vertical position two (2) inches above the level of the lower run of the rope or chain drive and two (2) inches within the periphery of the pulleys which the guard encloses thus forming a trough. These side filler members should be reinforced on the edges with 1½-inch by ¼-inch flat steel, riveted to the filling material at not greater than eight (8) inch centers; the reinforcing strip should be fastened or bolted to all guard supporting members with at least one ⅜-inch rivet or bolt at each intersection, and the ends should be secured to the ceiling with lag screws or bolts. The filling material shall be fastened to the framework of the guard and the filler supports by 3/16-inch rivets spaced on 4-inch centers. The width of the multiple drive shall be determined by measuring the distance from the outside of the first to the outside of the last rope or chain in the group accommodated by the pulley.

(5) *Guardrails and toeboards.* (i) Guardrail shall be forty-two (42) inches in height, with midrail between top rail and floor.

(ii) Posts shall be not more than eight (8) feet apart; they are to be permanent and substantial, smooth, and free from protruding nails, bolts, and splinters. If made of pipe, the post shall be one and one-fourth (1¼) inches inside diameter, or larger. If made of metal shapes or bars, their section shall be equal in strength to that of one and one-half (1½) by one and one-half (1½) by three-sixteenths (3/16) inch angle iron. If made of wood, the posts shall be two by four (2 x 4) inches or larger. The upper rail shall be two by four (2 x 4) inches, or two one by four (1 x 4) strips, one at the top and one at the side of posts. The midrail may be one by four (1 x 4) inches or more. The rails (metal shapes, metal bars, or wood), should be on that side of the posts which gives the best protection and support. Where panels are fitted with expanded metal or wire mesh as noted in Table O-12 the middle rails may be omitted. Where guard is exposed to contact with moving equipment, additional strength may be necessary.

(iii) Toeboards shall be four (4) inches or more in height, of wood, metal, or of metal grill not exceeding one (1) inch mesh. Toeboards at flywheel pits should preferably be placed as close to edge of the pit as possible.

TABLE O-13—HORIZONTAL OVERHEAD BELTS, ROPES, AND CHAINS 7 FEET OR MORE ABOVE FLOOR OR PLATFORM

	Width			
	From 10" to 14" inclusive	Over 14" to 24" inclusive	Over 24"	Material
MEMBERS				
Framework	1½" x 1½" x ¼"	2" x 2" x 5/16"	3" x 3" x ⅜"	Angle iron.
Filler (belt guards)	1½" x 3/16"	2" x 3/16"	2" x 5/16"	Flat iron.
Filler and vertical side member.	No. 20 A. W. G.	No. 18 A. W. G.	No. A. W. G.	Solid sheet metal.
Filler supports	2" x 5/16" flat iron	2" x ⅜" flat iron	2½" x 2½" x ¼" angle	Flat and angle.
Guard supports	2" x 5/16	2" x ⅜"	2½" x ⅜"	Flat iron.
FASTENINGS				
Filler supports to framework	(2) 5/16"	(2) ⅜"	(3) ½"	Rivets.
Filler flats to supports (belt guards).	(1) 5/16"	(1) 5/16"	(2) ⅜"	Flush rivets.
Filler to frame and supports (chain guards).	5/16" rivets spaced	8" centers on sides and 4" centers on bottom.		
Guard supports to frame work.	(2) ⅜"	(2) 7/16"	(2) ⅝"	Rivets or bolts.
Guard and supports to overhead ceiling.	¼" x 3½" lag screws or ½" bolts.	⅝" x 4" lag screws or ⅝" bolts.	¾" x 6" lag screws or ¾" bolts.	Lag screws or bolts.
DETAILS—SPACING, ETC.				
Width of guards	One-quarter wider than belt, rope, or chain drive.			
Spacing between filler supports.	20" C. to C	16" C. to C	16" C. to C	
Spacing between filler flats (belt guards).	2" apart	2½" apart	3" apart	
Spacing between guard supports	36" C. to C	36" C. to C	36" C. to C	
OTHER BELT GUARD FILLING PERMITTED				
Sheet metal fastened as in chain guards.	No. 20 A. W. G.	No. 18 A. W. G.	No. 18 A. W. G.	Solid or perforated.
Woven wire, 2" mesh	No. 12 A. W. G.	No. 10 A. W. G.	No. 8 A. W. G.	
	CLEARANCE FROM OUTSIDE OF BELT, ROPE, OR CHAIN DRIVE TO GUARD			
Distance center to center of shafts.	Up to 15' inclusive	Over 15' to 25' inclusive.	Over 25' to 40' inclusive.	Over 40'.
Clearance from belt, or chain to guard.	6"	10"	15"	20".

(p) *Care of equipment*—(1) *General.* All power-transmission equipment shall be inspected at intervals not exceeding 60 days and be kept in good working condition at all times.

(2) *Shafting.* (i) Shafting shall be kept in alignment, free from rust and excess oil or grease.

(ii) Where explosives, explosive dusts, flammable vapors or flammable liquids exist, the hazard of static sparks from shafting shall be carefully considered.

(3) *Bearings.* Bearings shall be kept in alignment and properly adjusted.

(4) *Hangers.* Hangers shall be inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly.

(5) *Pulleys.* (i) Pulleys shall be kept in proper alignment to prevent belts from running off.

(ii) One or both pulleys carrying a nonshifting belt should have crowned faces.

(iii) Cast-iron pulleys should be tested frequently with a hammer to disclose cracks in rim or spokes. It should be borne in mind that the sound is usually the pulley.

(iv) Split pulleys should be inspected to ascertain if all bolts holding together the sections of the pulley are tight.

(6) *Care of belts.* (i) Quarter-twist belts when installed without an idler can be used on drives running in one direction only. They will run off a pulley when direction of motion is reversed.

(ii) Inspection shall be made of belts, lacings, and fasteners and such equipment kept in good repair.

(iii) Where possible, dressing should not be applied when belt or rope is in motion; but, if this is necessary, it should be applied where belts or rope leave pulley, not where they approach. The same precautions apply to lubricating chains. In the case of V-belts, belt dressing is neither necessary nor advisable.

(7) *Lubrication.* The regular oilers shall wear tight-fitting clothing and should use cans with long spouts to keep their hands out of danger. Machinery shall be oiled when not in motion, wherever possible.

§ 1910.220 Effective dates.

(a) The provisions of this Subpart O shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.212(a).
§ 1910.213 (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (l), (m), (n), (o), (p), (q), and (r).
§ 1910.214 (a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (l), (m), (n), (o), (p), (q), (r), (s), (t), (u), and (v).
§ 1910.215 (a) and (b).
§ 1910.216 (a), (b), (c), and (f).
§ 1910.217 (a), (b), (c), and (d).
§ 1910.218 (a), (b), (d), (e), (g), and (j).
§ 1910.219 (b), (c), (d), (e), (f), (g), (h), (i), and (k).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) or (b) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2 (a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart O which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

[36 F.R. 15106, Aug. 13, 1971]

§ 1910.221 Sources of standards.

The standards contained in this Subpart O are derived from the following sources:

Standard	*Source*
§ 1910.212 --	41 CFR 50-204.5.
§ 1910.213 --	AMCI 01.1-1954-(R 1961), Safety Code for Woodworking Machinery.
§ 1910.214 --	ANSI 01.1-1954-(R 1961), Safety Code for Woodworking Machinery.
§ 1910.215 --	ANSI B7.1-1970, Safety Code for Abrasive Wheels.
§ 1910.216 --	ANSI B28.1-1967, Safety Code for Mills Calenders in the Rubber and Plastic Industries.
§ 1910.217 --	ANSI B11.1-1970, Safety Standard for Construction Care and Use of Mechanical Power Presses.
§ 1910.218 --	ANSI B24.1, 1970 Safety Standard for Forging.
§ 1910.219 --	ANSI B15.1-1953-(P 1958) Safety Code for Mechanical Power Transmission Apparatus

§ 1910.222 Standards organizations.

The standards and specifications of the following organizations have been referenced in this Subpart O: Copies of the references materials may be obtained from the issuing organizations

1. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

2. American Society of Mechanical Engineers. 345 East 47 Street, New York, NY 10017.

Subpart P—Hand and Portable Powered Tools and Other Hand-Held Equipment

§ 1910.241 Definitions.

As used in this subpart:

(a) *Explosive-actuated fastening tool terms*—(1) *Hammer-operated piston tool—low-velocity type.* A tool which, by means of a heavy mass hammer supplemented by a load, moves a piston designed to be captive to drive a stud, pin, or fastener into a work surface, always starting the fastener at rest and in contact with the work surface. It shall be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin, or fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel.

(2) *High-velocity tool.* A tool or machine which, when used with a load, propels or discharges a stud, pin, or fastener, at velocities in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel, for the purpose of impinging it upon, affixing it to, or penetrating another object or material.

(3) *Low-velocity piston tool.* A tool that utilizes a piston designed to be captive to drive a stud, pin, or fastener into a work surface. It shall be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin, or fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel.

(4) *Stud, pin, or fastener.* A fastening device specifically designed and manufactured for use in explosive-actuated fastening tools.

(5) *To chamber.* To fit properly without the use of excess force, the case being duly supported.

(6) *Explosive powerload, also known as load.* Any substance in any form capable of producing a propellant force.

(7) *Tool.* An explosive-actuated fastening tool, unless otherwise indicated, and all accessories pertaining thereto.

(8) *Protective shield or guard.* A device or guard attached to the muzzle end of the tool, which is designed to confine flying particles.

(b) *Abrasive wheel terms*—(1) *Mounted wheels.* Mounted wheels, usually 2-inch diameter or smaller, and of various shapes, may be either organic or inorganic bonded abrasive wheels. They are secured to plain or threaded steel mandrels.

(2) *Tuck pointing.* Removal, by grinding, of cement, mortar, or other nonmetallic jointing material.

(3) *Tuck pointing wheels.* Tuck pointing wheels, usually Type 1, reinforced organic bonded wheels have diameter, thickness and hole size dimension. They are subject to the same limitations of use and mounting as Type 1 wheels defined in subparagraph (10) of this paragraph.

LIMITATION: Wheels used for tuck pointing should be reinforced, organic bonded. (See § 1910.243(c)(1)(ii)(c).)

(4) *Portable grinding.* A grinding operation where the grinding machine is designed to be hand held and may be easily moved from one location to another.

(5) *Organic bonded wheels.* Organic wheels are wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

(6) *Safety guard.* A safety guard is an enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation.

(7) *Reinforced wheels.* The term "reinforced" as applied to grinding wheels shall define a class of organic wheels which contain strengthening fabric or filament. The term "reinforced" does not cover wheels using such mechanical additions as steel rings, steel cup backs or wire or tape winding.

(8) *Type 11 flaring cup wheels.* Type 11 flaring cup wheels have double diameter dimensions D and J, and in addition have thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face, W dimension. Type 11 wheels are subject to all limitations of use and mounting listed for Type 6 straight sided cup wheels definition in subparagraph (9) of this paragraph.

TYPE 11 FLARING CUP WHEELS

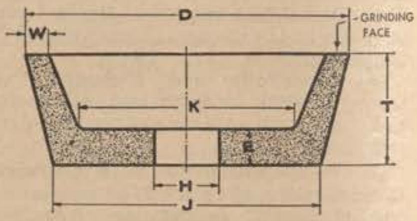


Figure P-1

Type 11 — Flaring-cup Wheel
Side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at the grinding face (W).

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition when unthreaded hole wheels are specified the inside flat, K dimension, shall be large enough to accommodate a suitable flange.

(9) *Type 6 straight cup wheels.* Type 6 cup wheels have diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on rim face, W dimension.

LIMITATION: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, must be large enough to accommodate a suitable flange.

TYPE 6 STRAIGHT CUP WHEELS

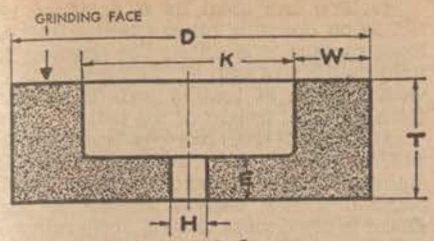


Figure P-2

Type 6 — Straight-cup Wheel

Side grinding wheel having a diameter, thickness and hole with one side straight or flat and the opposite side recessed. This type, however, differs from Type 5 in that the grinding is performed on the wall of the abrasive created by the difference between the diameter of the recess and the outside diameter of the wheel. Therefore, the wall dimension "W" takes precedence over the diameter of the recess as an essential intermediate dimension to describe this shape type.

(10) *Type 1 straight wheels.* Type 1 straight wheels have diameter, thickness, and hole size dimensions and should be used only on the periphery. Type 1 wheels shall be mounted between flanges.

LIMITATION: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other applications should not exceed one-half wheel diameter.

TYPE 1 STRAIGHT WHEELS

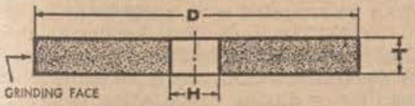


Figure P-3

Type 1 — Straight Wheel

Peripheral grinding wheel having a diameter, thickness and hole.

(c) *Power lawnmower terms*—(1) *Blade tip circle.* The path described by the outermost point of the blade as it is rotated about its shaft axis.

(2) *Guards.* A part or an assembly provided for shielding a hazardous area of a machine.

(3) *Catcher assemblies.* Parts or combinations of parts which provide a means for collecting grass clippings or debris.

(4) *Walk-behind mower.* A mower either pushed or self-propelled and normally guided by the operator walking behind the unit.

(5) *Operator area, walk-behind mowers.* For discharge interference purposes, that area confined within a circle no smaller than 30 inches in diameter, the center of which is located to the rear of the mower on its longitudinal centerline 30 inches behind the nearest blade tip circle.

(6) *Power reel mower.* A lawn-cutting machine utilizing a power source to rotate one or more helically formed blades about a horizontal axis to provide a shearing action with a stationary cutter bar or bed knife.

(7) *Power rotary mower.* A lawn-cutting machine utilizing a power source to rotate one or more cutting blades about a vertical axis.

(8) *Lowest blade position.* The lowest blade position under static conditions.

(9) *Riding mower.* A powered, self-propelled lawn-cutting vehicle on which the operator rides and controls the machine.

(10) *Sulky type mower.* Normally, a walk-behind mower which has been converted to a riding mower by the addition of a sulky.

(11) *Deadman control.* A control designed so that it will automatically interrupt power to a drive when the operator's actuating force is removed.

(d) *Jack terms*—(1) *Jack.* A jack is an appliance for lifting and lowering or moving horizontally a load by application of a pushing force.

NOTE: Jacks may be of the following types: Lever and ratchet, screw and hydraulic.

(2) *Rating.* The rating of a jack is the maximum working load for which it is designed to lift safely that load throughout its specified amount of travel.

NOTE: To raise the rated load of a jack, the point of application of the load, the applied force, and the length of lever arm should be those designated by the manufacturer for the particular jack considered.

§ 1910.242 Hand and portable powered tools and equipment, general.

(a) *General requirements.* Each employer shall be responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees.

(b) *Compressed air used for cleaning.* Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and personal protective equipment.

§ 1910.243 Guarding of portable powered tools.

(a) *Woodworking, portable powered tools*—(1) *Portable circular saws.* All portable, power-driven saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to covering position.

(2) *"Dead man" controls.* Hand-held, power-driven woodworking tools shall be provided with "dead man" control, such as a spring-actuated switch, valve, or equivalent device, so that the power will be automatically shut off whenever the operator releases the control.

(3) *Portable belt sanding machines.* Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs onto a pulley. These guards shall effectively prevent the hands or fingers of the operator from coming in contact with the nip points. The unused run of the sanding belt shall be guarded against accidental contact.

(4) *Cracked saws.* All cracked saws shall be removed from service.

(5) *Grounding.* Electrical grounding requirements for portable woodworking machinery see Subpart O, § 1910.213(a)(11).

(b) *Pneumatic powered tools and hose*—(1) *Portable tools.* (i) The operating trigger on portable hand-operated utilization equipment shall be so located as to minimize the possibility of its accidental operation and shall be arranged to close the air inlet valve automatically when the pressure of the operator's hand is removed.

(ii) A tool retainer shall be installed on each piece of utilization equipment which, without such a retainer, may eject the tool.

(2) *Airhose.* Hose and hose connections used for conducting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected.

(c) *Portable abrasive wheels*—(1) *General requirements.* (i) All abrasive wheels shall be used only on machines provided with safety guards as defined in the following subparagraphs of this paragraph.

EXCEPTIONS: This requirement shall not apply to the following classes of wheels and conditions.

(*a*) Wheels used for internal work while within the work being ground.

(*b*) Mounted wheels used in portable operations (see definition § 1910.241(b)(1)) 2 inches and smaller in diameter.

(*c*) Types 16, 17, 18, 18R, and 19 cones and plugs and threaded hole pot balls where the work offers protection.

(ii) (*a*) The safety guard shall cover the spindle end, nut, and flange projections. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard.

(*b*) Exception: Safety guards on all operations where the work provides a suitable measure of protection to the operator, may be so constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted.

(*c*) Exception: The spindle end, nut, and outer flange may be exposed on machines designed as portable saws.

(2) *Cup wheels.* Cup wheels (Types 6 and 11) shall be protected by:

(i) Safety guards as specified in subparagraph (1) of this paragraph; or,

(ii) Special "revolving cup guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one-third of the wheel thickness. The mounting features shall conform with all regulations. (See subparagraph (5) of this paragraph.) It is necessary to maintain clearance between the wheel side and the guard. The clearance shall not exceed one-sixteenth inch; or,

(iii) Some other form of guard that will insure as good protection as that which would be provided by the guards specified in subdivision (i) or (ii) of this subparagraph.

(3) *Vertical portable grinders.* Safety guards used on machines known as right angle head or vertical portable grinders shall have a maximum exposure angle of 180°, and the guard shall be so located so as to be between the operator and the wheel during use. Adjustment of guard shall be such that pieces of an accidentally broken wheel will be deflected away from the operator. (See Figure P-4.)

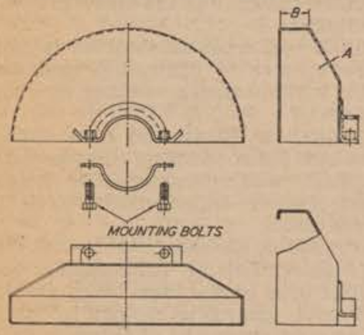


FIGURE NO. P-4

(4) *Other portable grinders.* The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines shall not exceed 180° and the top half of the wheel shall be enclosed at all times. (See Figures P-5 and P-6.)

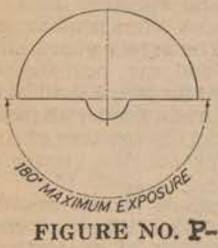


FIGURE NO. P-5

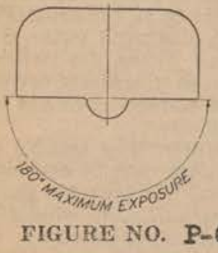


FIGURE NO. P-6

(5) *Mounting and inspection of abrasive wheels.* (i) Immediately before mounting, all wheels shall be closely inspected and sounded by the user (ring test, see Subpart O, § 1910.215(d)(1)) to make sure they have not been damaged in transit, storage, or otherwise. The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.

(ii) Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion. To accomplish this, the machine spindle shall be made to nominal (standard) size plus zero minus .002 inch, and the wheel hole shall be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.

(iii) All contact surfaces of wheels, blotters, and flangers shall be flat and free of foreign matter.

(iv) When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

(v) Requirements for the use of flanges and blotters, see Subpart O, § 1910.215(c).

(d) *Explosive actuated fastening tools*—(1) *General requirements.* (i) Explosive-actuated fastening tools which are actuated by explosives or any similar means and propel a stud, pin, fastener, or other object for the purpose of affixing it by penetration to any other object shall meet the design requirements in "American National Standard Safety Requirements for Explosive-Actuated Fastening Tools," ANSI A10.3–1970. This requirement does not apply to devices designed for attaching objects to soft construction materials, such as wood, plaster, tar, dry wallboard, and the like, or to stud welding equipment.

(ii) Operators and assistants using tools shall be safeguarded by means of eye protection. Head and face protection shall be used, as required by working conditions, as set forth in Subpart I.

(2) *Inspection, maintenance, and tool handling*—(i) *High-velocity tools.* Tools of this type shall have the characteristics outlined in (*a*) through (*h*) of this subdivision and, at the discretion of the manufacturer, any additional safety features he may wish to incorporate.

(*a*) The muzzle end of the tool shall have a protective shield or guard at least 3½ inches in diameter, mounted perpendicular to and concentric with the barrel, and designed to confine any flying fragments or particles that might otherwise create a hazard at the time of firing.

(*b*) Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield, guard, fixture, or jig designed and built by the manufacturer of the tool being used, which provides this degree of protection, shall be used as a substitute.

(*c*) The tool shall be so designed that it cannot be fired unless it is equipped with a standard protective shield or guard, or a special shield, guard, fixture, or jig.

(*d*) (*1*) The firing mechanism shall be so designed that the tool cannot fire during loading or preparation to fire, or if the tool should be dropped while loaded.

(*2*) Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

(*e*) The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool.

(*f*) The tool shall be so designed that it will not operate when equipped with the standard guard indexed to the center position if any bearing surface of the guard is tilted more than 8° from contact with the work surface.

(*g*) The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

(*h*) The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

(ii) Tools of the low-velocity-piston type shall have the characteristics outlined in (*a*) through (*e*) of this subdivision and, at the discretion of the manufacturer, any additional safety features he may wish to incorporate.

(*a*) The muzzle end of the tool shall be designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield shall be supplied with each tool.

(*b*) (*1*) The tool shall be designed so that it shall not in ordinary usage propel or discharge a stud, pin, or fastener while loading or during preparation to fire, or if the tool should be dropped while loaded.

(*2*) Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

(*c*) The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool.

(*d*) The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

(*e*) The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

(iii) Tools of the hammer-operated piston tools—low-velocity type shall have the characteristics outlined in (*a*) through (*e*) of this subdivision and, at the discretion of the manufacturer, any additional safety features he may wish to incorporate.

(*a*) The muzzle end of the tool shall be so designed that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield shall be supplied with each tool.

(*b*) The tool shall be so designed that it shall not in ordinary usage propel or discharge a stud, pin, or fastener while loading, or during preparation to fire, or if the tool should be dropped while loaded.

(*c*) Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

(*d*) The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

(*e*) The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

(3) *Requirements for loads and fasteners*. (i) There shall be a standard means of identifying the power levels of loads used in tools. Such means of identification shall be a uniform color and numbering system, as shown in Table P-1. Colors and printed descriptions shall be strikingly printed on the container to provide a visual indication of the power level of the load.

(ii) Caseless loads shall be coded to identify similar powerload levels by color, number, configuration, or other appropriate method.

TABLE P-1—IDENTIFICATION OF CASED LOADS

Power level	Color identification		Nominal velocity (±45 f.p.s)
	Case color	Load color	
1	Brass	Gray	300
2	Brass	Brown	390
3	Brass	Green	480
4	Brass	Yellow	570
5	Brass	Red	660
6	Brass	Purple	750
7	Nickel	Gray	840
8	Nickel	Brown	930
9	Nickel	Green	1,020
10	Nickel	Yellow	1,110
11	Nickel	Red	1,200
12	Nickel	Purple	1,290

NOTE: The nominal velocity applies to ⅜-inch diameter 350-grain ballistic slug fired in a test device and has no reference to actual fastener velocity developed in any specific size or type of tool.

(iii) No load (cased or caseless) shall be used if it will accurately chamber in any existing approved commercially available low-velocity piston tool or hammer operated piston tool—low-velocity type and will cause a fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel. No individual test firing of a series shall exceed 300 feet per second by more than 8 percent.

(iv) Fasteners used in tools shall be only those specifically manufactured for use in such tools.

(4) *Operating requirements*. (i) Before using a tool, the operator shall inspect it to determine to his satisfaction that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

(ii) When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired.

(iii) Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any workmen, and hands should be kept clear of the open barrel end.

(iv) No tools shall be loaded unless being prepared for immediate use, nor shall an unattended tool be left loaded.

(v) In case of a misfire, the operator shall hold the tool in the operating position for at least 30 seconds. He shall then try to operate the tool a second time. He shall wait another 30 seconds, holding the tool in the operating position; then he shall proceed to remove the explosive load in strict accordance with the manufacturer's instructions. Misfired cartridges should be placed carefully in a metal container filled with water, and returned to the supervisor for disposal.

(vi) A tool shall never be left unattended in a place where it would be available to unauthorized persons.

(vii) Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

(viii) Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying-missile hazard on the other side.

(ix) (*a*) Fasteners shall not be driven directly into materials such as brick or concrete closer than 3 inches from the unsupported edge or corner, or into steel surfaces closer than one-half inch from the unsupported edge or corner, unless a special guard, fixture, or jig is used. (Exception: Low-velocity tools may drive no closer than 2 inches from an edge in concrete or one-fourth inch in steel.)

(*b*) When fastening other materials, such as a 2- by 4-inch wood section to a concrete surface, it is permissible to drive a fastener of no greater than $\frac{7}{32}$-inch shank diameter not closer than 2 inches from the unsupported edge or corner of the work surface.

(x) Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.

(xi) No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.

(xii) Tools shall not be used in an explosive or flammable atmosphere.

(xiii) All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.

(xiv) Any tool found not in proper working order shall be immediately removed from service. The tool shall be inspected at regular intervals and shall be repaired in accordance with the manufacturer's specifications.

(e) *Power lawnmowers*—(1) *General requirements*. (i) Power lawnmowers of the walk-behind, riding-rotary, and reel power lawnmowers designed for sale to the general public shall meet the design specifications in "American National Standard Safety Specifications for Power Lawnmowers" ANSI B71.1–1968. These specifications do not apply to sulky-type mowers, flail mowers, sicklebar mowers, or mowers designed for commercial use.

(ii) All power-driven chains, belts, and gears shall be so positioned or otherwise guarded to prevent the operator's accidental contact therewith, during normal starting, mounting, and operation of the machine.

(iii) A shutoff device shall be provided to stop operation of the motor or engine. This device shall require manual and intentional reactivation to restart the motor or engine.

(iv) All positions of the operating controls shall be clearly identified.

(v) The words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording shall be clearly visible at an engine starting control point on self-propelled mowers.

(2) *Walk-behind and riding rotary mowers*. (i) The mower blade shall be enclosed except on the bottom and the enclosure shall extend to or below the lowest cutting point of the blade in the lowest blade position.

(ii) Guards which must be removed to install a catcher assembly shall comply with the following:

(*a*) Warning instructions shall be affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place.

(*b*) The catcher assembly or the guard shall be shipped and sold as part of the mower.

(*c*) The instruction manual shall state that the mower shall not be used without either the catcher assembly or the guard in place.

(*d*) The catcher assembly, when properly and completely installed, shall not create a condition which violates the limits given for the guarded opening.

(iii) Openings in the blade enclosure, intended for the discharge of grass, shall be limited to a maximum vertical angle of the opening of 30°. Measurements shall be taken from the lowest blade position.

(iv) The total effective opening area of the grass discharge opening(s) shall not exceed 1,000 square degrees on units having a width of cut less than 27½ inches, or 2,000 square degrees on units having a width of cut 27½ inches or over.

(v) The word "Caution," or stronger wording, shall be placed on the mower at or near each discharge opening.

(vi) Wheel drive disengaging controls, except dead-man controls, shall move opposite to the direction of vehicle motion in order to disengage the drive. Dead-man controls shall comply with § 1910.241(c)(11), and may operate in any direction to disengage the drive.

(vii) Blade(s) shall stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching, or shutting off power.

(viii) In a multipiece blade, the means of fastening the cutting members to the body of the blade or disc shall be so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use.

(ix) The maximum tip speed of any blade shall be 19,000 feet per minute.

(3) *Walk-behind rotary mowers.* (i) The horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, shall not contact the operator area.

(ii) There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

(*a*) A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle.

(*b*) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

(iii) The highest point(s) on the front of the blade enclosure, except discharge openings, shall be such that any line extending a maximum of 15° downward from the horizontal toward the blade shaft axis (axes) shall not intersect the horizontal plane within the blade tip circle. The highest point(s) on the blade enclosure, front, except discharge openings, shall not exceed 1¼ inches above the lowest blade position. Mowers with a swing-over handle are to be considered as having no front in the blade enclosure and therefore shall comply with subparagraph (2) (i) of this paragraph.

(iv) The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.

(v) A positive upstop or latch shall be provided for the mower handle in the normal operating position(s). The upstop shall not be subject to unintentional disengagement during normal operation of the mower. The upstop or latch shall not allow the center or the handle grips to come closer than 17 inches horizontally behind the closest path of the mower blade(s) unless manually disengaged.

(vi) A swing-over handle, which complies with the above requirements, will be permitted.

(4) *Riding rotary mowers.* (i) The highest point(s) of all openings in the blade enclosure, front shall be limited by a vertical angle of opening of 15° and a maximum distance of 1¼ inches above the lowest cutting point of the blade in the lowest blade position.

(ii) Opening(s) shall be placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position.

(iii) There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

(*a*) A minimum unobstructed horizontal distance of 6 inches from the end of the discharge chute to the blade tip circle.

(*b*) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

(iv) Mowers shall be provided with stops to prevent jackknifing or locking of the steering mechanism.

(v) Vehicle stopping means shall be provided.

(vi) Hand-operated wheel drive disengaging controls shall move opposite to the direction of vehicle motion in order to disengage the drive. Foot-operated wheel drive disengaging controls shall be depressed to disengage the drive. Dead-man controls, both hand and foot operated, shall comply with § 1910.241 (c)(11) and may operate in any direction to disengage the drive.

§ 1910.244 Other portable tools and equipment.

(a) *Jacks*—(1) *Loading and marking.* (i) The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load.

(ii) The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.

(2) *Operation and maintenance.* (i) In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.

(ii) The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.

(iii) After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.

(iv) Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.

(v) All jacks shall be properly lubricated at regular intervals. The lubricating instructions of the manufacturer should be followed, and only lubricants recommended by him should be used.

(vi) Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:

(*a*) For constant or intermittent use at one locality, once every 6 months,

(*b*) For jacks sent out of shop for special work, when sent out and when returned,

(*c*) For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.

(vii) Repair or replacement parts shall be examined for possible defects.

(viii) Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.

(b) *Abrasive blast cleaning nozzles.* The blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

§ 1910.245 Effective dates.

(a) The provisions of this Subpart P shall become effective on August 27, 1971, except as provided in the remaining paragraphs of this section.

(b) The following provisions shall become effective on February 15, 1972:

§ 1910.243 (a)(1), (a)(2), (a)(3), (b)(1), (c)(1), (c)(2), (c)(3), (d)(1), (d)(2), and (e).

(c) Notwithstanding anything in paragraph (a), (b), or (d) of this section, any provision in any other section of this subpart which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(d) Notwithstanding anything in paragraph (a) of this section, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2 (a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this Subpart P which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.246 Sources of standards.

Sec.	*Source*
1910.241(a)	ANSI A10.3 (1970), Safety Requirements for explosive actuated fastening tools.
1910.241(b)	ANSI B7.1-1970, Safety Code for the use, care, and protection of abrasive wheels.
1910.241(c)	ANSI B71.1-1968, Safety Specifications for power lawn mowers.
1910.241(d)	ANSI B30.1-1943. Safety Code for jacks.
1910.242	41 CFR 50-204.4 and 50-204.8.
1910.243(a)	ANSI O1.1-1954 (R1961), Safety Code for woodworking machines.
1910.243(b)	ANSI B19.1-1938, Compressed Air Machinery and Equipment.
1910.243(c)	ANSI B7.1-1970, Safety Code for Abrasive Materials.
1910.243(d)	ANSI 10.3-1970, Explosive Actuated Fastening Tools.
1910.243(e)	ANSI, BF1-1968, Safety Specifications for Power Lawn Mowers.
1910.244(a)	ANSI B30.1-1943 (R1952), Safety Code for Jacks.
1910.244(b)	ANSI Z9.4-1968, Ventilation and Safe Practices of Abrasive Blasting Operations.

§ 1910.247 Standards organizations.

Specific standards of the following organization have been referenced in this subpart. Copies of the referenced materials may be obtained from the issuing organization.

American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

Subpart Q—Welding, Cutting, and Brazing

§ 1910.251 Definitions.

As used in this subpart:

(a) "Welder" and "welding operator" mean any operator of electric or gas welding and cutting equipment.

(b) "Approved" means listed or approved by a nationally recognized testing laboratory, such as Factory Mutual Engineering Corp., or Underwriters' Laboratories, Inc.

(c) All other welding terms are used in accordance with American Welding Society—Terms and Definitions—A3.0–1969.

§ 1910.252 Welding, cutting, and brazing.

(a) *Installation and operation of oxygen-fuel gas systems for welding and cutting*—(1) *General requirements.* (i) *Flammable mixture.* Mixtures of fuel gases and air or oxygen may be explosive and shall be guarded against. No device or attachment facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch, shall be allowed unless approved for the purpose.

(ii) *Maximum pressure.* Under no condition shall acetylene be generated, piped (except in approved cylinder manifolds) or utilized at a pressure in excess of 15 p.s.i. gage pressure or 30 p.s.i. absolute pressure. (The 30 p.s.i. absolute pressure limit is intended to prevent unsafe use of acetylene in pressurized chambers such as caissons, underground excavations or tunnel construction.) This requirement is not intended to apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use. The use of liquid acetylene shall be prohibited.

(iii) *Apparatus.* Only approved apparatus such as torches, regulators or pressure-reducing valves, acetylene generators, and manifolds shall be used.

(iv) *Personnel.* Workmen in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be instructed and judged competent by their employers for this important work before being left in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment including generators, and oxygen or fuel-gas distribution piping systems shall be readily available.

(2) *Cylinders and containers*—(i) *Approval and marking.* (*a*) All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Parts 171–179.

(*b*) Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder. This method conforms to the American National Standard Method for Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1–1954.

(*c*) Compressed gas cylinders shall be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1–1965.

(*d*) All cylinders with a water weight capacity of over 30 pounds shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.

(ii) *Storage of cylinders—general.* (*a*) Cylinders shall be kept away from radiators and other sources of heat.

(*b*) Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet from highly combustible materials such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.

(*c*) Empty cylinders shall have their valves closed.

(*d*) Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.

(iii) *Fuel-gas cylinder storage.* Inside a building, cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.

(*a*) For storage in excess of 2,000 cubic feet total gas capacity of cylinders or 300 pounds of liquefied petroleum gas, a separate room or compartment conforming to the requirements specified in subparagraphs (*6*)(vi)(*a*) (*8*) and (*9*) of this paragraph shall be provided, or cylinders shall be kept outside or in a special building. Special buildings, rooms or compartments shall have no open flame for heating or lighting and shall be well ventilated. They may also be used for storage of calcium carbide in quantities not to exceed 600 pounds, when contained in metal containers complying with subparagraphs (7)(i) (*a*) and (*b*) of this paragraph. Signs should be conspicuously posted in such rooms reading, "Danger—No Smoking, Matches or Open Lights," or other equivalent wording.

(*b*) Acetylene cylinders shall be stored valve end up.

(iv) *Oxygen storage.* (*a*) Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease; or near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment.

(*b*) Oxygen cylinders stored in outside generator houses shall be separated from the generator or carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hour. This partition shall be without openings and shall be gastight.

(*c*) Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

(*d*) Where a liquid oxygen system is to be used to supply gaseous oxygen for welding or cutting and the system has a storage capacity of more than 13,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70° F.), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70° F), including unconnected reserves on hand at the site, it shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566–1965.

(v) *Operating procedures.* (*a*) Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves. A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank.

(*b*) (*1*) When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose. Valve-protection caps, where cylinder is designed to accept a cap, shall always be in place.

(*2*) Cylinders shall not be dropped or struck or permitted to strike each other violently.

(*3*) Valve-protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve-protection caps are designed to protect cylinder valves from damage.

(*4*) Unless cylinders are secured on a special truck, regulators shall be removed and valve-protection caps, when provided for, shall be put in place before cylinders are moved.

(*5*) Cylinders not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations only one key or handle is required for each manifold.

(*6*) Cylinder valves shall be closed before moving cylinders.

(*7*) Cylinder valves shall be closed when work is finished.

(*8*) Valves of empty cylinders shall be closed.

(*9*) Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire-resistant shields shall be provided.

(*10*) Cylinders shall not be placed where they might become part of an electric circuit. Contacts with third rails, trolley wires, etc., shall be avoided. Cylinders shall be kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice such as the tapping of an electrode against a cylinder to strike an arc shall be prohibited.

(*11*) Cylinders shall never be used as rollers or supports, whether full or empty.

(*12*) The numbers and markings stamped into cylinders shall not be tampered with.

(*13*) No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by him, shall refill a cylinder.

(*14*) No one shall tamper with safety devices in cylinders or valves.

(*15*) Cylinders shall not be dropped or otherwise roughly handled.

(*16*) Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve shall be opened slightly for an instant and then closed. Always stand to one side of the outlet when opening the cylinder valve.

(*17*) A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, the supplier shall be notified.

(*18*) (*i*) Cylinder valves shall not be tampered with nor should any attempt be made to repair them. If trouble is experienced, the supplier should be sent a report promptly indicating the character of the trouble and the cylinder's serial number. Supplier's instructions as to its disposition shall be followed.

(*ii*) Complete removal of the stem from a diaphragm-type cylinder valve shall be avoided.

(*c*) (*1*) Fuel-gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.

(*2*) Cylinders shall be handled carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve or safety devices and cause leakage.

(*3*) Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. The valve shall be opened while standing to one side of the outlet; never in front of it. Never crack a fuel-gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition.

(*4*) Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.

(*5*) Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.

(*6*) If cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, the cylinders shall be taken outdoors away from sources of ignition and slowly emptied.

(*7*) A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.

(*8*) Safety devices shall not be tampered with.

(*9*) Fuel-gas shall never be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

(*10*) The cylinder valve shall always be opened slowly.

(*11*) An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn.

(*12*) Where a special wrench is required it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel-gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders at least one such wrench shall always be available for immediate use.

(3) *Manifolding of cylinders*—(i) *Fuel-gas manifolds*. (*a*) Manifolds shall be approved either separately for each component part or as an assembled unit.

(*b*) Except as provided in subdivision (*c*) of this subdivision fuel-gas cylinders connected to one manifold inside a building shall be limited to a total capacity not exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

(*c*) Fuel-gas cylinders connected to one manifold having an aggregate capacity exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas shall be located outdoors, or in a separate building or room constructed in accordance with subparagraphs (6)(vi)(*a*) (*8*) and (*9*) of this paragraph.

(*d*) Separate manifold buildings or rooms may also be used for the storage of drums of calcium carbide and cylinders containing fuel gases as provided in subparagraph (2)(iii) of this paragraph. Such buildings or rooms shall have no open flames for heating or lighting and shall be well-ventilated.

(*e*) High-pressure fuel-gas manifolds shall be provided with approved pressure regulating devices.

(ii) *High-pressure oxygen manifolds (for use with cylinders having a Department of Transportation service pressure above 200 p.s.i.g.)*. (*a*) Manifolds shall be approved either separately for each component part or as an assembled unit.

(*b*) Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

(*c*) Except as provided in subdivision (*d*) of this subdivision oxygen cylinders connected to one manifold shall be limited to a total gas capacity of 6,000 cubic feet. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

(*d*) An oxygen manifold, to which cylinders having an aggregate capacity of more than 6,000 cubic feet of oxygen are connected, should be located outdoors or in a separate noncombustible building. Such a manifold, if located inside a building having other occupancy, shall be located in a separate room of noncombustible construction having a fire-resistance rating of at least one-half hour or in an area with no combustible material within 20 feet of the manifold.

(*e*) An oxygen manifold or oxygen bulk supply system which has storage capacity of more than 13,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70° F.), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (measured at 14.7 p.s.i.a. and 70° F.), including unconnected reserves on hand at the site, shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965.

(*f*) High-pressure oxygen manifolds shall be provided with approved pressure-regulating devices.

(iii) *Low-pressure oxygen manifolds (for use with cylinders having a Department of Transportation service pressure not exceeding 200 p.s.i.g.)*. (*a*) Manifolds shall be of substantial construction suitable for use with oxygen at a pressure of 250 p.s.i.g. They shall have a minimum bursting pressure of 1,000 p.s.i.g. and shall be protected by a safety relief device which will relieve at a maximum pressure of 500 p.s.i.g. DOT-4L200 cylinders have safety devices which relieve at a maximum pressure of 250 p.s.i.g. (or 235 p.s.i.g. if vacuum insulation is used).

(*b*) Hose and hose connections subject to cylinder pressure shall comply with subparagraph (5)(v) of this paragraph. Hose shall have a minimum bursting pressure of 1,000 p.s.i.g.

(*c*) The assembled manifold including leads shall be tested and proven gas-tight at a pressure of 300 p.s.i.g. The fluid used for testing oxygen manifolds shall be oil-free and not combustible.

(*d*) The location of manifolds shall comply with subdivisions (ii) (*b*), (*c*), (*d*), and (*e*) of this subdivision.

(*e*) The following sign shall be conspicuously posted at each manifold:

Low-Pressure Manifold
Do Not Connect High-Pressure Cylinders
Maximum Pressure—250 P.S.I.G.

(iv) *Portable outlet headers*. (*a*) Portable outlet headers shall not be used indoors except for temporary service where the conditions preclude a direct supply from outlets located on the service piping system.

(b) Each outlet on the service piping from which oxygen or fuel-gas is withdrawn to supply a portable outlet header shall be equipped with a readily accessible shutoff valve.

(c) Hose and hose connections used for connecting the portable outlet header to the service piping shall comply with subparagraph (5)(v) of this paragraph.

(d) Master shutoff valves for both oxygen and fuel-gas shall be provided at the entry end of the portable outlet header.

(e) Portable outlet headers for fuel-gas service shall be provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets, unless an approved pressure-reducing regulator, an approved back-flow check valve, or an approved hydraulic back-pressure valve is installed at each outlet. Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.

(f) Each service outlet on portable outlet headers shall be provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve.

(g) Materials and fabrication procedures for portable outlet headers shall comply with subparagraphs (4) (i), (ii), and (v) of this paragraph.

(h) Portable outlet headers shall be provided with frames which will support the equipment securely in the correct operating position and protect them from damage during handling and operation.

(v) *Manifold operating procedures.* (a) Cylinder manifolds shall be installed under the supervision of someone familiar with the proper practices with reference to their construction and use.

(b) All component parts used in the methods of manifolding described in subdivision (i) of this subdivision shall be approved as to materials, design and construction either separately or as an assembled unit.

(c) All manifolds and parts used in methods of manifolding shall be used only for the gas or gases for which they are approved.

(d) When acetylene cylinders are coupled, approved flash arresters shall be installed between each cylinder and the coupler block. For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.

(e) Each fuel-gas cylinder lead should be provided with a backflow check valve.

(f) The aggregate capacity of fuel-gas cylinders connected to a portable manifold inside a building shall not exceed 3,000 cubic feet of gas.

(g) Acetylene and liquefied fuel-gas cylinders shall be manifolded in a vertical position.

(h) The pressure in the gas cylinders connected to and discharged simultaneously through a common manifold shall be approximately equal.

(4) *Service piping systems*—(i) *Materials and design.* (a)(1) Piping and fittings shall comply with Section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Pressure Piping ANSI B31.1, 1967, insofar as it does not conflict with subdivisions (i) and (ii) of this subdivision:

(i) Pipe shall be at least Schedule 40 and fittings shall be at least standard weight in sizes up to and including 6-inch nominal.

(ii) Copper tubing shall be Types K or L in accordance with the Standard Specification for Seamless Copper Water Tube, ASTM B88–66a.

(2) Piping shall be steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except as provided in (b) and (c) of this subdivision.

(b)(1) Oxygen piping and fittings at pressures in excess of 700 p.s.i.g., shall be stainless steel or copper alloys.

(2) Hose connections and hose complying with subparagraph (5)(v) of this paragraph may be used to connect the outlet of a manifold pressure regulator to piping providing the working pressure of the piping is 250 p.s.i.g. or less and the length of the hose does not exceed 5 feet. Hose shall have a minimum bursting pressure of 1,000 p.s.i.g.

(3) When oxygen is supplied to a service piping system from a low-pressure oxygen manifold without an intervening pressure regulating device, the piping system shall have a minimum design pressure of 250 p.s.i.g. A pressure regulating device shall be used at each station outlet when the connected equipment is for use at pressures less than 250 p.s.i.g.

(c)(1) Piping for acetylene or acetylenic compounds shall be steel or wrought iron.

(2) Unalloyed copper shall not be used for acetylene or acetylenic compounds except in listed equipment.

(ii) *Piping joints.* (a) Joints in steel or wrought iron piping shall be welded, threaded or flanged. Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, malleable iron or nodular iron. Gray or white cast iron fittings are prohibited.

(b) Joints in brass or copper pipe shall be welded, brazed, threaded, or flanged. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800° F.) filler metal.

(c) Joints in seamless copper, brass, or stainless steel tubing shall be approved gas tubing fittings or the joints shall be brazed. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800° F.) filler metal.

(iii) *Installation.* (a) Distribution lines shall be installed and maintained in a safe operating condition.

(b) Piping located inside or outside of buildings may be placed above or below ground. All piping shall be run as directly as practicable, protected against physical damage, proper allowance being made for expansion and contraction, jarring and vibration. Pipe laid underground in earth shall be located below the frost line and protected against corrosion. After assembly, piping shall be thoroughly blown out with air, nitrogen, or carbon dioxide to remove foreign materials. For oxygen piping, only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used.

(c) Only piping which has been welded or brazed shall be installed in tunnels, trenches or ducts. Shutoff valves shall be located outside such conduits. Oxygen piping may be placed in the same tunnel, trench or duct with fuel-gas pipelines, provided there is good natural or forced ventilation.

(d) Low points in piping carrying moist gas shall be drained into drip pots constructed so as to permit pumping or draining out the condensate at necessary intervals. Drain valves shall be installed for this purpose having outlets normally closed with screw caps or plugs. No open end valves or petcocks shall be used, except that in drips located out of doors, underground, and not readily accessible, valves may be used at such points if they are equipped with means to secure them in the closed position. Pipes leading to the surface of the ground shall be cased or jacketed where necessary to prevent loosening or breaking.

(e) Gas cocks or valves shall be provided for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in any emergency. Underground valve boxes or manholes should be avoided wherever possible. There shall also be provided a shutoff valve in the discharge line from the generator, gas holder, manifold or other source of supply.

(f) Shutoff valves shall not be installed in safety relief lines in such a manner that the safety relief device can be rendered ineffective.

(g) Fittings and lengths of pipe shall be examined internally before assembly and, if necessary, freed from scale or dirt. Oxygen piping and fittings shall be washed out with a suitable solution which will effectively remove grease and dirt but will not react with oxygen. Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose.

(h) Piping shall be thoroughly blown out after assembly to remove foreign materials. For oxygen piping, oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used. For other piping, air or inert gas may be used.

(i) When flammable gas lines or other parts of equipment are being purged of air or gas, open lights or other sources of ignition shall not be permitted near uncapped openings.

(j) No welding or cutting shall be performed on an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged. Only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used to purge oxygen lines.

(iv) *Painting and signs.* (a) Underground pipe and tubing and outdoor ferrous pipe and tubing shall be covered or painted with a suitable material for protection against corrosion.

(b) Aboveground piping systems shall be marked in accordance with the American National Standard Scheme for the

Identification of Piping Systems, ANSI A13.1–1956.

(*c*) Station outlets shall be marked to indicate the name of the gas.

(v) *Testing.* (*a*) Piping systems shall be tested and proved gastight at 1½ times the maximum operating pressure, and shall be thoroughly purged of air before being placed in service. The material used for testing oxygen lines shall be oil free and noncombustible. Flames shall not be used to detect leaks.

(*b*) When flammable gas lines or other parts of equipment are being purged of air or gas, sources of ignition shall not be permitted near uncapped openings.

(5) *Protective equipment, hose, and regulators*—(i) *General.* Equipment shall be installed and used only in the service for which it is approved and as recommended by the manufacturer.

(ii) *Pressure relief devices.* Service piping systems shall be protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location.

(iii) *Piping protective equipment.* (*a*) The fuel-gas and oxygen piping systems, including portable outlet headers shall incorporate the protective equipment shown in Figures Q–1, Q–2, and Q–3.

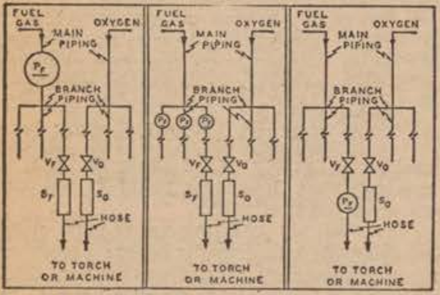


Fig. Q-1 Fig. Q-2 Fig. Q-3

LEGEND

P_F—Protective equipment in fuel gas piping
V_F—Fuel gas station outlet valve
V_O—Oxygen station outlet valve
S_F—Backflow prevention device(s) at fuel gas station outlet
S_O—Backflow prevention device(s) at oxygen station outlet

When only a portion of a fuel-gas system is to be used with oxygen, only that portion need comply with subparagraph (5)(iii)(*a*) of this paragraph.

(*b*) Approved protective equipment (designated P_F in Figs. Q–1, Q–2, and Q–3) shall be installed in fuel-gas piping to prevent:

(*1*) Backflow of oxygen into the fuel-gas supply system;

(*2*) Passage of a flash back into the fuel-gas supply system; and

(*3*) Excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

(*i*) The protective equipment shall be located in the main supply line, as in Figure Q–1 or at the head of each branch line, as in Figure Q–2 or at each location where fuel-gas is withdrawn, as in Figure Q–3. Where branch lines are of 2-inch pipe size or larger or of substantial length, protective equipment (designated as P_F) shall be located as shown in either Q–2 and Q–3.

(*ii*) Backflow protection shall be provided by an approved device that will prevent oxygen from flowing into the fuel-gas system or fuel from flowing into the oxygen system (see S_F, Figs. Q–1 and Q–2)

(*iii*) Flash-back protection shall be provided by an approved device that will prevent flame from passing into the fuel-gas system.

(*iv*) Back-pressure protection shall be provided by an approved pressure-relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower. The pressure-relief device shall be located on the downstream side of the backflow and flashback protection devices. The vent from the pressure-relief device shall be at least as large as the relief device inlet and shall be installed without low points that may collect moisture. If low points are unavoidable, drip pots with drains closed with screw plugs or caps shall be installed at the low points. The vent terminus shall not endanger personnel or property through gas discharge; shall be located away from ignition sources; and shall terminate in a hood or bend.

(*c*) If pipeline protective equipment incorporates a liquid, the liquid level shall be maintained, and a suitable antifreeze may be used to prevent freezing.

(*d*) Fuel gas for use with equipment not requiring oxygen shall be withdrawn upstream of the piping protective devices.

(iv) *Station outlet protective equipment.* (*a*) A check valve, pressure regulator, hydraulic seal, or combination of these devices shall be provided at each station outlet, including those on portable headers, to prevent backflow, as shown in Figures Q–1, Q–2, and Q–3 and designated as S_F and S_O.

(*b*) When approved pipeline protective equipment (designated P_F) is located at the station outlet as in Figure Q–3, no additional check valve, pressure regulator, or hydraulic seal is required.

(*c*) A shutoff valve (designated V_F and V_O) shall be installed at each station outlet and shall be located on the upstream side of other station outlet equipment.

(*d*) If the station outlet is equipped with a detachable regulator, the outlet shall terminate in a union connection that complies with the Regulator Connection Standards, 1958, Compressed Gas Association.

(*e*) If the station outlet is connected directly to a hose, the outlet shall terminate in a union connection complying with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.

(*f*) Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.

(*g*) Station outlets shall be equipped with a detachable outlet seal cap secured in place. This cap shall be used to seal the outlet except when a hose, a regulator, or piping is attached.

(*h*) Where station outlets are equipped with approved backflow and flashback protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided each outlet from such piping is equipped with a shutoff valve and provided the fuel-gas capacity of any one torch does not exceed 15 cubic feet per hour.

This subdivision does not apply to machines.

(v) *Hose and hose connections.* (*a*) Hose for oxy-fuel gas service shall comply with the Specification for Rubber Welding Hose, 1958, Compressed Gas Association and Rubber Manufacturers Association.

(*b*) The generally recognized colors are red for acetylene and other fuel-gas hose, green for oxygen hose, and black for inert-gas and air hose.

(*c*) When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, not more than 4 inches out of 12 inches shall be covered by tape.

(*d*) Hose connections shall comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.

(*e*) Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 p.s.i. Oil-free air or an oil-free inert gas shall be used for the test.

(*f*) Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.

(vi) *Pressure-reducing regulators.* (*a*) Pressure-reducing regulators shall be used only for the gas and pressures for which they are intended. The regulator inlet connections shall comply with Regulator Connection Standards, 1958, Compressed Gas Association.

(*b*) When regulators or parts of regulators, including gages, need repair, the work shall be performed by skilled mechanics who have been properly instructed.

(*c*) Gages on oxygen regulators shall be marked "USE NO OIL."

(*d*) Union nuts and connections on regulators shall be inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves. Damaged nuts or connections shall be destroyed.

(6) *Acetylene generators*—(i) *Approval and marking.* (*a*) Generators shall be of approved construction and shall be plainly marked with the maximum rate of acetylene in cubic feet per hour for which they are designed; the weight and size of carbide necessary for a single charge; the manufacturer's name and address; and the name or number of the type of generator.

(*b*) Carbide shall be of the size marked on the generator nameplate.

(ii) *Rating and pressure limitations.* (*a*) The total hourly output of a generator shall not exceed the rate for which it is approved and marked. Unless specifically approved for higher ratings, carbide-feed generators shall be rated at 1 cubic foot per hour per pound of carbide required for a single complete charge.

(*b*) Relief valves shall be regularly operated to insure proper functioning. Relief valves for generating chambers shall be set to open at a pressure not in excess of 15 p.s.i.g. Relief valves for hydraulic back pressure valves shall be set to open at a pressure not in excess of 20 p.s.i.g.

(*c*) Nonautomatic generators shall not be used for generating acetylene at pressures exceeding 1 p.s.i.g., and all water overflows shall be visible.

(iii) *Location*. The space around the generator shall be ample for free, unobstructed operation and maintenance and shall permit ready adjustment and charging.

(iv) *Stationary acetylene generators (automatic and nonautomatic)*. (*a*) (*1*) The foundation shall be so arranged that the generator will be level and so that no excessive strain will be placed on the generator or its connections. Acetylene generators shall be grounded.

(*2*) Generators shall be placed where water will not freeze. The use of common salt (sodium chloride) or other corrosive chemicals for protection against freezing is not permitted. (For heating systems see subdivision (6) (vi) (*c*) of this subparagraph.)

(*3*) Except when generators are prepared in accordance with subdivision (vii) (*e*) of this subparagraph, sources of ignition shall be prohibited in outside generator houses or inside generator rooms.

(*4*) Water shall not be supplied through a continuous connection to the generator except when the generator is provided with an adequate open overflow or automatic water shutoff which will effectively prevent overfilling of the generator. Where a noncontinuous connection is used, the supply line shall terminate at a point not less than 2 inches above the regularly provided opening for filling so that the water can be observed as it enters the generator.

(*5*) Unless otherwise specifically approved, generators shall not be fitted with continuous drain connections leading to sewers, but shall discharge through an open connection into a suitably vented outdoor receptacle or residue pit which may have such connections. An open connection for the sludge drawoff is desirable to enable the generator operator to observe leakage of generating water from the drain valve or sludge cock.

(*b*) (*1*) Each generator shall be provided with a vent pipe of Schedule 40 galvanized iron or steel, except that outside of buildings, vent pipes larger than 4 inches in diameter may be not less than 14 gage galvanized tubing or sheet steel.

(*2*) The escape or relief pipe shall be rigidly installed without traps and so that any condensation will drain back to the generator.

(*3*) The escape or relief pipe shall be carried full size to a suitable point outside the building. It shall terminate in a hood or bend located at least 12 feet above the ground, preferably above the roof, and as far away as practicable from windows or other openings into buildings and as far away as practicable from sources of ignition such as flues or chimneys and tracks used by locomotives. Generating chamber relief pipes shall not be inter-connected but shall be separately led to the outside air. The hood or bend shall be so constructed that it will not be obstructed by rain, snow, ice, insects, or birds. The outlet shall be at least 3 feet from combustible construction.

(*c*) (*1*) Gas holders shall be constructed on the gasometer principle, the bell being suitably guided. The gas bell shall move freely without tendency to bind and shall have a clearance of at least 2 inches from the shell.

(*2*) The gas holder may be located in the generator room, in a separate room or out of doors. In order to prevent collapse of the gas bell or infiltration of air due to a vacuum caused by the compressor or booster pump or cooling of the gas, a compressor or booster cutoff shall be provided at a point 12 inches or more above the landing point of the bell. When the gas holder is located indoors, the room shall be ventilated in accordance with subdivision (vi)(*b*) of this subparagraph and heated and lighted in accordance with subdivisions (vi) (*c*) and (*d*) of this subparagraph.

(*3*) When the gas holder is not located within a heated building, gas holder seals shall be protected against freezing.

(*4*) Means shall be provided to stop the generator-feeding mechanism before the gas holder reaches the upper limit of its travel.

(*5*) When the gas holder is connected to only one generator, the gas capacity of the holder shall be not less than one-third of the hourly rating of the generator.

(*6*) If acetylene is used from the gas holder without increase in pressure at some points but with increase in pressure by a compressor or booster pump at other points, approved piping protective devices shall be installed in each supply line. The low-pressure protective device shall be located between the gas holder and the shop piping, and the medium-pressure protective device shall be located between the compressor or booster pump and the shop piping (see Figure Q-4). Approved protective equipment (designated P_F) is used to prevent: Backflow of oxygen into the fuel-gas supply system; passage of a flashback into the fuel-gas supply system; and excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

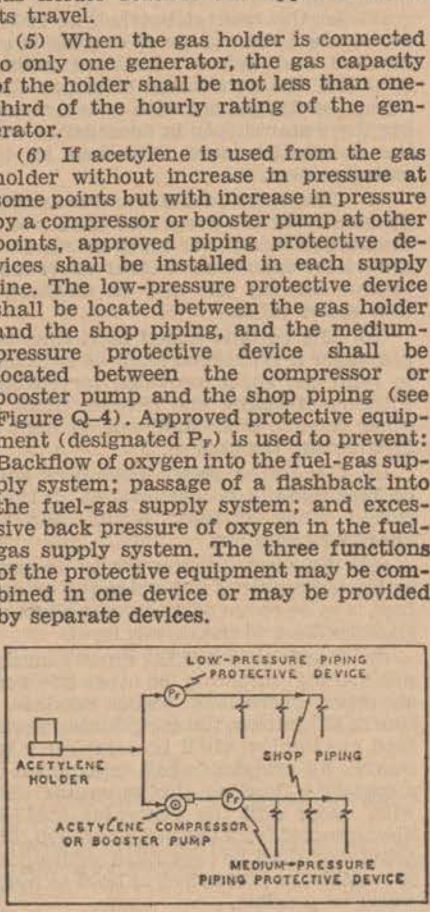

LOW-PRESSURE PIPING PROTECTIVE DEVICE
PF
SHOP PIPING
ACETYLENE HOLDER
PF
ACETYLENE COMPRESSOR OR BOOSTER PUMP
MEDIUM-PRESSURE PIPING PROTECTIVE DEVICE

Figure Q-4

(*d*) (*1*) The compressor or booster system shall be of an approved type.

(*2*) Wiring and electrical equipment in compressor or booster pump rooms or enclosures shall conform to the provisions of section 1910.324 for Class I, Division 2 locations.

(*3*) Compressors and booster pump equipment shall be located in well-ventilated areas away from open flames, electrical or mechanical sparks, or other ignition sources.

(*4*) Compressor or booster pumps shall be provided with pressure relief valves which will relieve pressure exceeding 15 p.s.i.g. to a safe outdoor location as provided in subdivision (*b*) of this subdivision, or by returning the gas to the inlet side or to the gas supply source.

(*5*) Compressor or booster pump discharge outlets shall be provided with approved protective equipment. (See subparagraph (5) of this paragraph.)

(v) *Portable acetylene generators*. (*a*) (*1*) All portable generators shall be of a type approved for portable use.

(*2*) Portable generators shall not be used within 10 feet of combustible material other than the floor.

(*3*) Portable generators shall not be used in rooms of total volume less than 35 times the total gas-generating capacity per charge of all generators in the room. Generators shall not be used in rooms having a ceiling height of less than 10 feet. (To obtain the gas-generating capacity in cubic feet per charge, multiply the pounds of carbide per charge by 4.5.)

(*4*) Portable generators shall be protected against freezing. The use of salt or other corrosive chemical to prevent freezing is prohibited.

(*b*) (*1*) Portable generators shall be cleaned and recharged and the air mixture blown off outside buildings.

(*2*) When charged with carbide, portable generators shall not be moved by crane or derrick.

(*3*) When not in use, portable generators shall not be stored in rooms in which open flames are used unless the generators contain no carbide and have been thoroughly purged of acetylene. Storage rooms shall be well ventilated.

(*4*) When portable acetylene generators are to be transported and operated on vehicles, they shall be securely anchored to the vehicles. If transported by truck, the motor shall be turned off during charging, cleaning, and generating periods.

(*5*) Portable generators shall be located at a safe distance from the welding position so that they will not be exposed to sparks, slag, or misdirection of the torch flame or overheating from hot materials or processes.

(vi) *Outside generator houses and inside generator rooms for stationary acetylene generators*. (*a*) (*1*) No opening in any outside generator house shall be located within 5 feet of any opening in another building.

(*2*) Walls, floors, and roofs of outside generator houses shall be of noncombustible construction.

(*3*) When a part of the generator house is to be used for the storage or manifolding of oxygen cylinders, the space to be so occupied shall be separated from the generator or carbide storage section by partition walls continuous from floor to roof or ceiling, of the type of construction stated in subdivision *(8)* of this subdivision. Such separation walls shall be without openings and shall be joined to the floor, other walls and ceiling or roof in a manner to effect a permanent gas-tight joint.

(4) Exit doors shall be located so as to be readily accessible in case of emergency.

(5) Explosion venting for outside generator houses and inside generator rooms shall be provided in exterior walls or roofs. The venting areas shall be equal to not less than 1 square foot per 50 cubic feet of room volume and may consist of any one or any combination of the following: Walls of light, noncombustible material preferably single-thickness, single-strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot.

(6) The installation of acetylene generators within buildings shall be restricted to buildings not exceeding one story in height; *Provided, however,* That this will not be construed as prohibiting such installations on the roof or top floor of a building exceeding such height.

(7) Generators installed inside buildings shall be enclosed in a separate room of ample size.

(8) The walls, partitions, floors, and ceilings of inside generator rooms shall be of noncombustible construction having a fire-resistance rating of at least 1 hour. The walls or partitions shall be continuous from floor to ceiling and shall be securely anchored. At least one wall of the room shall be an exterior wall.

(9) Openings from an inside generator room to other parts of the building shall be protected by a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour. Windows in partitions shall be wired glass and approved metal frames with fixed sash. Installation shall be in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80–1970.

(b) Inside generator rooms or outside generator houses shall be well ventilated with vents located at floor and ceiling levels.

(c) Heating shall be by steam, hot water, enclosed electrically heated elements or other indirect means. Heating by flames or fires shall be prohibited in outside generator houses or inside generator rooms, or in any enclosure communicating with them.

(d) *(1)* Generator houses or rooms shall have natural light during daylight hours. Where artificial lighting is necessary it shall be restricted to electric lamps installed in a fixed position. Unless specifically approved for use in atmospheres containing acetylene, such lamps shall be provided with enclosures of glass or other noncombustible material so designed and constructed as to prevent gas vapors from reaching the lamp or socket and to resist breakage. Rigid conduit with threaded connections shall be used.

(2) Lamps installed outside of wired-glass panels set in gas-tight frames in the exterior walls or roof of the generator house or room are acceptable.

(e) Electric switches, telephones, and all other electrical apparatus which may cause a spark, unless specifically approved for use inside acetylene generator rooms, shall be located outside the generator house or in a room or space separated from the generator room by a gas-tight partition, except that where the generator system is designed so that no carbide fill opening or other part of the generator is open to the generator house or room during the operation of the generator, and so that residue is carried in closed piping from the residue discharge valve to a point outside the generator house or room, electrical equipment in the generator house or room shall conform to the provisions of Subpart S of this part for Class I, Division 2 locations.

(vii) *Maintenance and operation.* *(a)* Unauthorized persons shall not be permitted in outside generator houses or inside generator rooms.

(1) Operating instructions shall be posted in a conspicuous place near the generator or kept in a suitable place available for ready reference.

(2) When recharging generators the order of operations specified in the instructions supplied by the manufacturer shall be followed.

(3) In the case of batch-type generators, when the charge of carbide is exhausted and before additional carbide is added, the generating chamber shall always be flushed out with water, renewing the water supply in accordance with the instruction card furnished by the manufacturer.

(4) The water-carbide residue mixture drained from the generator shall not be discharged into sewer pipes or stored in areas near open flames. Clear water from residue settling pits may be discharged into sewer pipes.

(b) The carbide added each time the generator is recharged shall be sufficient to refill the space provided for carbide without ramming the charge. Steel or other ferrous tools shall not be used in distributing the charge.

(c) Generator water chambers shall be kept filled to proper level at all times except while draining during the recharging operation.

(d) Whenever repairs are to be made or the generator is to be charged or carbide is to be removed, the water chamber shall be filled to the proper level.

(e) Previous to making repairs involving welding, soldering, or other hot work or other operations which produce a source of ignition, the carbide charge and feed mechanism shall be completely removed. All acetylene shall be expelled by completely flooding the generator shell with water and the generator shall be disconnected from the piping system. The generator shall be kept filled with water, if possible, or positioned to hold as much water as possible.

(f) Hot repairs shall not be made in a room where there are other generators unless all the generators and piping have been purged of acetylene. Hot repairs should preferably be made out of doors.

(7) *Calcium carbide storage*—(i) *Packaging.* *(a)* Calcium carbide shall be contained in metal packages of sufficient strength to prevent rupture. The packages shall be provided with a screw top or equivalent. These packages shall be constructed water- and air-tight. Solder shall not be used in such a manner that the package would fail if exposed to fire.

(b) Packages containing calcium carbide shall be conspicuously marked "Calcium Carbide—Dangerous If Not Kept Dry" or with equivalent warning.

(c) Caution: Metal tools, even the so-called spark resistant type may cause ignition of an acetylene and air mixture when opening carbide containers.

(d) Sprinkler systems shall not be installed in carbide storage rooms.

(ii) *Storage indoors.* *(a)* Calcium carbide in quantities not to exceed 600 pounds may be stored indoors in dry, waterproof, and well-ventilated locations.

(1) Calcium carbide not exceeding 600 pounds may be stored indoors in the same room with fuel-gas cylinders.

(2) Packages of calcium carbide, except for one of each size, shall be kept sealed. The seals shall not be broken when there is carbide in excess of 1 pound in any other unsealed package of the same size of carbide in the room.

(b) Calcium carbide exceeding 600 pounds but not exceeding 5,000 pounds shall be stored:

(1) In accordance with subdivision *(c)* of this subdivision.

(2) In an inside generator room or outside generator house; or

(3) In a separate room in a one-story building which may contain other occupancies, but without cellar or basement beneath the carbide storage section. Such rooms shall be constructed in accordance with subdivision (vi) *(a)* *(8)* and *(9)* of this subdivision and ventilated in accordance with subdivision (vi) *(b)* of this subdivision. These rooms shall be used for no other purpose.

(c) Calcium carbide in excess of 5,000 pounds shall be stored in one-story buildings without cellar or basement and used for no other purpose, or in outside generator houses. The location of such storage buildings shall be away from congested mercantile and manufacturing districts. If the storage building is of noncombustible construction, it may adjoin other one-story buildings if separated therefrom by unpierced firewalls; if it is detached less than 10 feet from such building or buildings, there shall be no opening in any of the mutually exposing sides of such buildings within 10 feet. If the storage building is of combustible construction, it shall be at least 20 feet from any other one- or two-story building, and at least 30 feet from any other building exceeding two stories.

(iii) *Storage outdoors.* *(a)* Calcium carbide in unopened metal containers may be stored outdoors.

(*b*) Carbide containers to be stored outdoors shall be examined to make sure that they are in good condition. Periodic reexaminations shall be made for rusting or other damage to a container that might affect its water or air tightness.

(*c*) The bottom tier of each row shall be placed on wooden planking or equivalent, so that the containers will not come in contact with the ground or ground water.

(*d*) Storage areas shall be at least 10 feet from lines of adjoining property that may be built upon.

(*e*) Containers of carbide which have been in storage the longest shall be used first.

(8) *Public exhibitions and demonstrations*—(i) *Installation requirements.* Installation and operation of welding, cutting, and related equipment shall be done by, or under the supervision of, a competent operator to insure the personal protection of viewers and demonstrators as well as the protection from fire, of materials in and around the site and the building itself.

(ii) *Procedures.* (*a*) Cylinders containing compressed gases for use at the site shall not be charged in excess of one-half their maximum permissible content. (Cylinders of nonliquefied gases and acetylene shall be charged to not more than one-half their maximum permissible charged pressure in p.s.i.g. Cylinders of liquefied gases shall be charged to not more than one-half the maximum permissible capacity in pounds.)

(*b*) Cylinders located at the site shall be connected for use except that enough additional cylinders may be stored at the site to furnish approximately 1 day's consumption of each gas used. Other cylinders shall be stored in an approved storage area preferably outdoors, but this storage area shall not be located near a building exit.

(*c*) Cylinders in excess of 40 pounds total weight being transported to or from the site shall be carried on a hand or motorized truck.

(*d*) The site shall be constructed, equipped, and operated in such a manner that the demonstration will be carried out so as to minimize the possibility of injury to viewers.

(*e*) Sites involving the use of compressed gases shall be located so as not to interfere with the egress of people during an emergency.

(*f*) The fire department shall be notified in advance of such use of the site.

(*g*) (*1*) Each site shall be provided with a portable fire extinguisher of appropriate size and type and with a pail of water.

(*2*) The public and combustible materials at the site shall be protected from flames, sparks, and molten metal.

(*h*) Hoses shall be located and protected so that they will not be physically damaged.

(*i*) (*1*) Cylinder valves shall be closed when equipment is unattended.

(*2*) Where caps are provided for valve protection, such caps shall be in place except when the cylinders are in service or connected ready for service.

(*3*) Cylinders shall be located or secured so that they cannot be knocked over.

(b) *Application, installation, and operation of arc welding and cutting equipment*—(1) *General*—(i) *Equipment selection.* Welding equipment shall be chosen for safe application to the work to be done as specified in subparagraph (2) of this paragraph.

(ii) *Installation.* Welding equipment shall be installed safely as specified by subparagraph (3) of this paragraph.

(iii) *Instruction.* Workmen designated to operate arc welding equipment shall have been properly instructed and qualified to operate such equipment as specified in subparagraph (4) of this paragraph.

(2) *Application of arc welding equipment*—(i) *General.* Assurance of consideration of safety in design is obtainable by choosing apparatus complying with the Requirements for Electric Arc-Welding Apparatus, NEMA EW-1-1962, National Electrical Manufacturers Association or the Safety Standard for Transformer-Type Arc-Welding Machines, ANSI C33.2—1956, Underwriters' Laboratories.

(ii) *Environmental conditions.* (*a*) Standard machines for arc welding service shall be designed and constructed to carry their rated load with rated temperature rises where the temperature of the cooling air does not exceed 40° C. (104° F.) and where the altitude does not exceed 3,300 feet, and shall be suitable for operation in atmospheres containing gases, dust, and light rays produced by the welding arc.

(*b*) Unusual service conditions may exist, and in such circumstances machines shall be especially designed to safely meet the requirements of the service. Chief among these conditions are:

(*1*) Exposure to unusually corrosive fumes.

(*2*) Exposure to steam or excessive humidity.

(*3*) Exposure to excessive oil vapor.

(*4*) Exposure to flammable gases.

(*5*) Exposure to abnormal vibration or shock.

(*6*) Exposure to excessive dust.

(*7*) Exposure to weather.

(*8*) Exposure to unusual seacoast or shipboard conditions.

(iii) *Voltage.* Open circuit (No load) voltages of arc welding and cutting machines should be as low as possible consistent with satisfactory welding or cutting being done. The following limits shall not be exceeded:

(*a*) Alternating-current machines

(*1*) Manual arc welding and cutting—80 volts.

(*2*) Automatic (machine or mechanized) arc welding and cutting—100 volts.

(*b*) Direct-current machines

(*1*) Manual arc welding and cutting—100 volts.

(*2*) *Automatic* (machine or mechanized) arc welding and cutting—100 volts.

(*c*) When special welding and cutting processes require values of open circuit voltages higher than the above, means shall be provided to prevent the operator from making accidental contact with the high voltage by adequate insulation or other means.

(*d*) For a.c. welding under wet conditions or warm surroundings where perspiration is a factor, the use of reliable automatic controls for reducing no load voltage is recommended to reduce the shock hazard.

(iv) *Design.* (*a*) A controller integrally mounted in an electric motor driven welder shall have capacity for carrying rated motor current, shall be capable of making and interrupting stalled rotor current of the motor, and may serve as the running overcurrent device if provided with the number of overcurrent units as specified by Subpart S of this part. Starters with magnetic undervoltage release should be used with machines installed more than one to a circuit to prevent circuit overload caused by simultaneously starting of several motors upon return of voltage.

(*b*) On all types of arc welding machines, control apparatus shall be enclosed except for the operating wheels, levers, or handles. Control handles and wheels should be large enough to be easily grasped by a gloved hand.

(*c*) Input power terminals, tap change devices and live metal parts connected to input circuits shall be completely enclosed and accessible only by means of tools.

(*d*) Terminals for welding leads should be protected from accidental electrical contact by personnel or by metal objects i.e., vehicles, crane hooks, etc. Protection may be obtained by use of: dead-front receptacles for plug connections; recessed openings with nonremovable hinged covers; heavy insulating sleeving or taping or other equivalent electrical and mechanical protection. If a welding lead terminal which is intended to be used exclusively for connection to the work is connected to the grounded enclosure, it must be done by a conductor at least two AWG sizes smaller than the grounding conductor and the terminal shall be marked to indicate that it is grounded.

(*e*) No connections for portable control devices such as push buttons to be carried by the operator shall be connected to an a.c. circuit of higher than 120 volts. Exposed metal parts of portable control devices operating on circuits above 50 volts shall be grounded by a grounding conductor in the control cable.

(*f*) Auto transformers or a.c. reactors shall not be used to draw welding current directly from any a.c. power source having a voltage exceeding 80 volts.

(3) *Installation of arc welding equipment*—(i) *General.* Installation including power supply shall be in accordance with the requirements of Subpart S of this part.

(ii) *Grounding.* (*a*) The frame or case of the welding machine (except engine-driven machines shall be grounded under the conditions and according to the methods prescribed in Subpart S of this part.

(*b*) Conduits containing electrical conductors shall not be used for completing a work-lead circuit. Pipelines shall not be used as a permanent part of a work-lead circuit, but may be used during construction, extension or repair providing current is not carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work-lead cable.

(*c*) Chains, wire ropes, cranes, hoists, and elevators shall not be used to carry welding current.

(*d*) Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints shall be bonded or provided with adequate current collecting devices and appropriate periodic inspection should be conducted to ascertain that no condition of electrolysis or shock, or fire hazard exists by virtue of such use.

(*e*) All ground connections shall be checked to determine that they are mechanically strong and electrically adequate for the required current.

(iii) *Supply connections and conductors.* (*a*) A disconnecting switch or controller shall be provided at or near each welding machine which is not equipped with such a switch or controller mounted as an integral part of the machine. The switch shall be in accordance with Subpart S of this part. Overcurrent protection shall be provided as specified in Subpart S of this part. A disconnect switch with overload protection or equivalent disconnect and protection means, permitted by Subpart S of this part, shall be provided for each outlet intended for connection to a portable welding machine.

(*b*) For individual welding machines, the rated current-carrying capacity of the supply conductors shall be not less than the rated primary current of the welding machines.

(*c*) For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating shall be determined in each case according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.

(*d*) In operations involving several welders on one structure, d.c. welding process requirements may require the use of both polarities; or supply circuit limitations for a.c. welding may require distribution of machines among the phases of the supply circuit. In such cases no load voltages between electrode holders will be 2 times normal in d.c. or 1, 1.41, 1.73, or 2 times normal on a.c. machines. Similar voltage differences will exist if both a.c. and d.c. welding are done on the same structure.

(*1*) All d.c. machines shall be connected with the same polarity.

(*2*) All a.c. machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

(4) *Operation and maintenance.*—(i) *General.* Workmen assigned to operate or maintain arc welding equipment shall be acquainted with the requirements of subparagraphs (b), (d), (e), and (f) of this section; if doing gas-shielded arc welding, also Recommended Safe Practices for Gas-Shielded Arc Welding, A6.1-1966, American Welding Society.

(ii) *Machine hook up.* Before starting operations all connections to the machine shall be checked to make certain they are properly made. The work lead shall be firmly attached to the work; magnetic work clamps shall be freed from adherent metal particles of spatter on contact surfaces. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.

(iii) *Grounding.* Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.

(iv) *Leaks.* There shall be no leaks of cooling water, shielding gas or engine fuel.

(v) *Switches.* It shall be determined that proper switching equipment for shutting down the machine is provided.

(vi) *Manufacturers' instructions.* Printed rules and instructions covering operation of equipment supplied by the manufacturers shall be strictly followed.

(vii) *Electrode holders.* Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.

(viii) *Electric shock.* Cables with splices within 10 feet of the holder shall not be used. The welder should not coil or loop welding electrode cable around parts of his body.

(ix) *Maintenance.* (*a*) The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Repairs shall be made only by qualified personnel.

(*b*) Machines which have become wet shall be thoroughly dried and tested before being used.

(*c*) Work and electrode lead cables should be frequently inspected for wear and damage. Cables with damaged insulation or exposed bare conductors shall be replaced. Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for the purpose. The connecting means shall have insulation adequate for the service conditions.

(c) *Installation and operation of resistance welding equipment*—(1) *General*—(i) *Installation.* All equipment shall be installed by a qualified electrician in conformance with Subpart S of this part. There shall be a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine, so that the power can be shut off when the machine or its controls are to be serviced.

(ii) *Thermal protection.* Ignitron tubes used in resistance welding equipment shall be equipped with a thermal protection switch.

(iii) *Personnel.* Workmen designated to operate resistance welding equipment shall have been properly instructed and judged competent to operate such equipment.

(iv) *Guarding.* Controls of all automatic or air and hydraulic clamps shall be arranged or guarded to prevent the operator from accidentally activating them.

(2) *Spot and seam welding machines (nonportable)*—(i) *Voltage.* All external weld initiating control circuits shall operate on low voltage, not over 120 volts, for the safety of the operators.

(ii) *Capacitor welding.* Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) shall be suitably insulated and protected by complete enclosures, all doors of which shall be provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks). Such interlocks or contacts shall be so designed as to effectively interrupt power and short circuit all capacitors when the door or panel is open. A manually operated switch or suitable positive device shall be installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.

(iii) *Interlocks.* All doors and access panels of all resistance welding machines and control panels shall be kept locked and interlocked to prevent access, by unauthorized persons, to live portions of the equipment.

(iv) *Guarding.* All press welding machine operations, where there is a possibility of the operator's fingers being under the point of operation, shall be effectively guarded by the use of a device such as an electronic eye safety circuit, two hand controls or protection similar to that prescribed for punch press operation, § 1910.217. All chains, gears, operating bus linkage, and belts shall be protected by adequate guards, in accordance with § 1910.219.

(v) *Shields.* The hazard of flying sparks shall be, wherever practical, eliminated by installing a shield guard of safety glass or suitable fire-resistant plastic at the point of operation. Additional shields or curtains shall be installed as necessary to protect passing persons from flying sparks. (See paragraph (e)(2)(i)(*c*) of this section.)

(vi) *Foot switches.* All foot switches shall be guarded to prevent accidental operation of the machine.

(vii) *Stop buttons.* Two or more safety emergency stop buttons shall be provided on all special multispot welding machines, including 2-post and 4-post weld presses.

(viii) *Safety pins.* On large machines, four safety pins with plugs and receptacles (one in each corner) shall be provided so that when safety pins are removed and inserted in the ram or platen, the press becomes inoperative.

(ix) *Grounding*. Where technically practical, the secondary of all welding transformers used in multispot, projection and seam welding machines shall be grounded. This may be done by permanently grounding one side of the welding secondary current circuit. Where not technically practical, a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternates. Safety disconnect shall be arranged to open both sides of the line when welding current is not present.

(3) *Portable welding machines*—(i) *Counterbalance*. All portable welding guns shall have suitable counterbalanced devices for supporting the guns, including cables, unless the design of the gun or fixture makes counterbalancing impractical or unnecessary.

(ii) *Safety chains*. All portable welding guns, transformers and related equipment that is suspended from overhead structures, eye beams, trolleys, etc. shall be equipped with safety chains or cables. Safety chains or cables shall be capable of supporting the total shock load in the event of failure of any component of the supporting system.

(iii) *Clevis*. When trolleys are used to support portable welding equipment, with suitable forged steel clevis for the attachment of safety chains. Each clevis shall be capable of supporting the total shock load of the suspended equipment in the event of trolley failure.

(iv) *Switch guards*. All initiating switches, including retraction and dual schedule switches, located on the portable welding gun shall be equipped with suitable guards capable of preventing accidental initiation through contact with fixturing, operator's clothing, etc. Initiating switch voltage shall not exceed 24 volts.

(v) *Moving holder*. The movable holder, where it enters the gun frame, shall have sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder.

(vi) *Grounding*. The secondary and case of all portable welding transformers shall be grounded. Secondary grounding may be by center tapped secondary or by a center tapped grounding reactor connected across the secondary.

(4) *Flash welding equipment*.—(i) *Ventilation and flash guard*. Flash welding machines shall be equipped with a hood to control flying flash. In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation shall be provided in accordance with paragraph (f) of this section.

(ii) *Fire curtains*. For the protection of the operators of nearby equipment, fire-resistant curtains or suitable shields shall be set up around the machine and in such a manner that the operators movements are not hampered.

(5) *Hazards and precautions*. A job hazard analysis shall be made, by qualified personnel, of the operations to be performed on each welding machine to determine the safeguards and personal protective equipment that shall be used for each job.

(6) *Maintenance*. Periodic inspection shall be made by qualified maintenance personnel, and records of the same maintained. The operator shall be instructed to report any equipment defects to his supervisor and the use of the equipment shall be discontinued until safety repairs have been completed. .

(d) *Fire prevention and protection*—(1) *Basic precautions*. For elaboration of these basic precautions and of the special precautions of subparagraph (2) of this paragraph as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors (including outside contractors) and those in management on whose property cutting and welding is to be performed, see, Standard for Fire Prevention in Use of Cutting and Welding Processes, NFPA Standard 51B, 1962. The basic precautions for fire prevention in welding or cutting work are:

(i) *Fire hazards*. If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.

(ii) *Guards*. If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

(iii) *Restrictions*. If the requirements stated in subdivision (i) and (ii) of this subdivision cannot be followed then welding and cutting shall not be performed.

(2) *Special precautions*. When the nature of the work to be performed falls within the scope of subdivision (ii) of this subdivision certain additional precautions may be necessary:

(i) *Combustible material*. Wherever there are floor openings or cracks in the flooring that cannot be closed, precautions shall be taken so that no readily combustible materials on the floor below will be exposed to sparks which might drop through the floor. The same precautions shall be observed with regard to cracks or holes in walls, open doorways and open or broken windows.

(ii) *Fire extinguishers*. Suitable fire extinguishing equipment shall be maintained in a state of readiness for instant use. Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers depending upon the nature and quantity of the combustible material exposed.

(iii) *Fire watch*. (*a*) Fire watchers shall be required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

(*1*) Appreciable combustible material, in building construction or contents, closer than 35 feet to the point of operation.

(*2*) Appreciable combustibles are more than 35 feet away but are easily ignited by sparks.

(*3*) Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.

(*4*) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

(*b*) Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

(iv) *Authorization*. Before cutting or welding is permitted, the area shall be inspected by the individual responsible for authorizing cutting and welding operations. He shall designate precautions to be followed in granting authorization to proceed preferably in the form of a written permit.

(v) *Floors*. Where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, the floor shall be swept clean for a radius of 35 feet. Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields. Where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock.

(vi) *Prohibited areas*. Cutting or welding shall not be permitted in the following situations:

(*a*) In areas not authorized by management.

(*b*) In sprinklered buildings while such protection is impaired.

(*c*) In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts.

(*d*) In areas near the storage of large quantities of exposed, readily ignitible materials such as bulk sulfur, baled paper, or cotton.

(vii) *Relocation of combustibles*. Where practicable, all combustibles shall be relocated at least 35 feet from the work site. Where relocation is impracticable, combustibles shall be protected with flameproofed covers or otherwise shielded with metal or asbestos guards or curtains. Edges of covers at the floor should be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile.

(viii) *Ducts*. Ducts and conveyor systems that might carry sparks to distant combustibles shall be suitably protected or shut down.

(ix) *Combustible walls*. Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, fire-resistant shields or guards shall be provided to prevent ignition.

(x) *Noncombustible walls.* If welding is to be done on a metal wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles. Where combustibles are not relocated, a fire watch on the opposite side from the work shall be provided.

(xi) *Combustible cover.* Welding shall not be attempted on a metal partition, wall, ceiling or roof having a combustible covering nor on walls or partitions of combustible sandwich-type panel construction.

(xii) *Pipes.* Cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings or roofs shall not be undertaken if the work is close enough to cause ignition by conduction.

(xiii) *Management.* Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property and:

(*a*) Based on fire potentials of plant facilities, establish areas for cutting and welding, and establish procedures for cutting and welding, in other areas.

(*b*) Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes.

(*c*) Insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process.

(*d*) Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

(xiv) *Supervisor.* The Supervisor:

(*a*) Shall be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process.

(*b*) Shall determine the combustible materials and hazardous areas present or likely to be present in the work location.

(*c*) Shall protect combustibles from ignition by the following:

(*1*) Have the work moved to a location free from dangerous combustibles.

(*2*) If the work cannot be moved, have the combustibles moved to a safe distance from the work or have the combustibles properly shielded against ignition.

(*3*) See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding.

(*d*) Shall secure authorization for the cutting or welding operations from the designated management representative.

(*e*) Shall determine that the cutter or welder secures his approval that conditions are safe before going ahead.

(*f*) Shall determine that fire protection and extinguishing equipment are properly located at the site.

(*g*) Where fire watches are required, he shall see that they are available at the site.

(xv) *Fire prevention precautions.* Cutting or welding shall be permitted only in areas that are or have been made fire safe. Within the confines of an operating plant or building, cutting and welding should preferably be done in a specific area designed for such work, such as a maintenance shop or a detached outside location. Such areas should be of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas. When work cannot be moved practically, as in most construction work, the area shall be made safe by removing combustibles or protecting combustibles from ignition sources.

(3) *Welding or cutting containers*—(i) *Used containers.* No welding, cutting, or other hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. Any pipe lines or connections to the drum or vessel shall be disconnected or blanked.

(ii) *Venting and purging.* All hollow spaces, cavities or containers shall be vented to permit the escape of air or gases before preheating, cutting or welding. Purging with inert gas is recommended.

(4) *Confined spaces*—(i) *Accidental contact.* When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine be disconnected from the power source.

(ii) *Torch valve.* In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the gas supply to the torch positively shutoff at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable, the torch and hose shall also be removed from the confined space.

(e) *Protection of personnel*—(1) *General*—(i) *Railing.* A welder or helper working on platforms, scaffolds, or runways shall be protected against falling. This may be accomplished by the use of railings, safety belts, life lines, or some other equally effective safeguards.

(ii) *Welding cable.* Welders shall place welding cable and other equipment so that it is clear of passageways, ladders, and stairways.

(2) *Eye protection*—(i) *Selection.* (*a*) Helmets or hand shields shall be used during all arc welding or arc cutting operations, excluding submerged arc welding. Goggles should also be worn during arc welding or cutting operations to provide protection from injurious rays from adjacent work, and from flying objects. The goggles may have either clear or colored glass, depending upon the amount of exposure to adjacent welding operations. Helpers or attendants shall be provided with proper eye protection.

(*b*) Goggles or other suitable eye protection shall be used during all gas welding or oxygen cutting operations. Spectacles without side shields, with suitable filter lenses are permitted for use during gas welding operations on light work, for torch brazing or for inspection.

(*c*) All operators and attendants of resistance welding or resistance brazing equipment shall use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required.

(*d*) Eye protection in the form of suitable goggles shall be provided where needed for brazing operations not covered in (*a*), (*b*), and (*c*) of this subdivision.

(ii) *Specifications for protectors.* (*a*) Helmets and hand shields shall be made of a material which is an insulator for heat and electricity. Helmets, shields and goggles shall be not readily flammable and shall be capable of withstanding sterilization.

(*b*) Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc.

(*c*) Helmets shall be provided with filter plates and cover plates designed for easy removal.

(*d*) All parts shall be constructed of a material which will not readily corrode or discolor the skin.

(*e*) Goggles shall be ventilated to prevent fogging of the lenses as much as practicable.

(*f*) Cover lenses or plates should be provided to protect each helmet, hand shield or goggle filter lens or plate.

(*g*) All glass for lenses shall be tempered, substantially free from striae, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical correction for defective vision, the front and rear surfaces of lenses and windows shall be smooth and parallel.

(*h*) Lenses shall bear some permanent distinctive marking by which the source and shade may be readily identified.

(*i*) The following is a guide for the selection of the proper shade numbers. These recommendations may be varied to suit the individual's needs.

Welding operation	*Shade No.*
Shielded metal-arc welding—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous)—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous)—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	12
Shielded metal-arc welding:	
3/16-, 7/32-, ¼-inch electrodes	12
5/16-, ⅜-inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to ⅛ inch	4 or 5
Gas welding (medium) ⅛ inch to ½ inch	5 or 6
Gas welding (heavy) ½ inch and over	6 or 8

NOTE: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

(*j*) All filter lenses and plates shall meet the test for transmission of radiant energy prescribed in ANSI Z87.1–1968—American National Standard Practice for Occupational and Educational Eye and Face Protection.

(iii) *Protection from arc welding rays.* Where the work permits, the welder should be enclosed in an individual booth painted with a finish of low reflectivity such as zinc oxide (an important factor for absorbing ultraviolet radiations) and lamp black, or shall be enclosed with noncombustible screens similiarly painted. Booths and screens shall permit circulation of air at floor level. Workers or other persons adjacent to the welding areas shall be protected from the rays by noncombustible or flameproof screens or shields or shall be required to wear appropriate goggles.

(3) *Protective clothing*—(i) *General requirements.* Employees exposed to the hazards created by welding, cutting, or brazing operations shall be protected by personal protective equipment in accordance with the requirements of § 1910.132. Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed.

(ii) *Specified protective clothing.* Protective means which may be employed are as follows:

(*a*) Except when engaged in light work, all welders should wear flameproof gauntlet gloves.

(*b*) Flameproof aprons made of leather, asbestos, or other suitable material may also be desirable as protection against radiated heat and sparks.

(*c*) Woolen clothing is preferable to cotton because it is not so readily ignited and helps protect the welder from changes in temperature. Cotton clothing, if used, should be chemically treated to reduce its combustibility. All outer clothing such as jumpers or overalls should be reasonably free from oil or grease.

(*d*) Sparks may lodge in rolled-up sleeves or pockets of clothing, or cuffs of overalls or trousers. It is therefore recommended that sleeves and collars be kept buttoned and pockets be eliminated from the front of overalls and aprons. Trousers or overalls should not be turned up on the outside.

(*e*) For heavy work, fire-resistant leggings, high boots, or other equivalent means should be used.

(*f*) In production work a sheet metal screen in front of the worker's legs can provide further protection against sparks and molten metal in cutting operations.

(*g*) Capes or shoulder covers made of leather or other suitable materials should be worn during overhead welding or cutting operations. Leather skull caps may be worn under helmets to prevent head burns.

(*h*) For overhead welding and cutting, or welding and cutting in extremely confined spaces, ear protection is sometimes desirable.

(*i*) Where there is exposure to sharp or heavy falling objects, or a hazard of bumping in confined spaces, hard hats or head protectors should be used.

(4) *Work in confined spaces*—(i) *General.* As used herein confined space is intended to mean a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship.

(ii) *Ventilation.* Ventilation is a prerequisite to work in confined spaces. For ventilation requirements see paragraph (f) of this section.

(iii) *Securing cylinders and machinery.* When welding or cutting is being performed in any confined spaces the gas cylinders and welding machines shall be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

(iv) *Lifelines.* Where a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety belts and lifelines are used for this purpose they shall be so attached to the welder's body that his body cannot be jammed in a small exit opening. An attendant with a preplanned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.

(v) *Electrode removal.* When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine disconnected from the power source.

(vi) *Gas cylinder shutoff.* In order to to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practicable the torch and hose shall also be removed from the confined space.

(vii) *Warning sign.* After welding operations are completed, the welder shall mark the hot metal or provide some other means of warning other workers.

(f) *Health protection and ventilation*—(1) *General*—(i) *Contamination.* The requirements in this paragraph have been established on the basis of the following three factors in arc and gas welding which govern the amount of contamination to which welders may be exposed:

(*a*) Dimensions of space in which welding is to be done (with special regard to height of ceiling).

(*b*) Number of welders.

(*c*) Possible evolution of hazardous fumes, gases, or dust according to the metals involved.

(ii) *Ventilation.* It is recognized that in individual instances other factors may be involved in which case ventilation or respiratory protective devices should be provided as needed to meet the equivalent requirements of this section. Such factors would include:

(*a*) Atmospheric conditions.

(*b*) Heat generated.

(*c*) Presence of volatile solvents.

(iii) *Screens.* When welding must be performed in a space entirely screened on all sides, the screens shall be so arranged that no serious restriction of ventilation exists. It is desirable to have the screens so mounted that they are about 2 feet above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.

(iv) *Maximum allowable concentration.* Local exhaust or general ventilating systems shall be provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in § 1910.93.

(v) *Precautionary labels.* A number of potentially hazardous materials are employed in fluxes, coatings, coverings, and filler metals used in welding and cutting or are released to the atmosphere during welding and cutting. These include but are not limited to the materials itemized in paragraphs (f) (5) through (12) of this section. The suppliers of welding materials shall determine the hazard, if any, associated with the use of their materials in welding, cutting, etc.

(*a*) All filler metals and fusible granular materials shall carry the following notice, as a minimum, on tags, boxes, or other containers:

Caution

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation. See ANSI Z49.1–1967 Safety in Welding and Cutting published by the American Welding Society.

(*b*) Brazing (welding) filler metals containing cadmium in significant amounts shall carry the following notice on tags, boxes, or other containers:

Warning

CONTAINS CADMIUM—POISONOUS FUMES MAY BE FORMED ON HEATING

Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Z49.1–1967.

If chest pain, cough, or fever develops after use call physician immediately.

Keep children away when using.

(*c*) Brazing and gas welding fluxes containing fluorine compounds shall have a cautionary wording to indicate that they contain fluorine compounds. One such cautionary wording recommended by the American Welding Society for brazing and gas welding fluxes reads as follows:

Caution

CONTAINS FLUORIDES

This flux when heated gives off fumes that may irritate eyes, nose and throat.

1. Avoid fumes—use only in well-ventilated spaces.
2. Avoid contact of flux with eyes or skin.
3. Do not take internally.

(2) *Ventilation for general welding and cutting*—(i) *General.* Mechanical ventilation shall be provided when welding or cutting is done on metals not covered in subparagraphs (5) through (12),

of this paragraph. (For specific materials, see the ventilation requirements of subparagraphs (5) through (12) of this paragraph.)

(*a*) In a space of less than 10,000 cubic feet per welder.

(*b*) In a room having a ceiling height of less than 16 feet.

(*c*) In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.

(ii) *Minimum rate.* Such ventilation shall be at the minimum rate of 2,000 cubic feet per minute per welder, except where local exhaust hoods and booths as per subparagraph (3) of this paragraph, or airline respirators approved by the U.S. Bureau of Mines for such purposes are provided. Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in subdivision (i) of this subdivision are not present.

(3) *Local exhaust hoods and booths.* Mechanical local exhaust ventilation may be by means of either of the following:

(i) *Hoods.* Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of airflow sufficient to maintain a velocity in the direction of the hood of 100 linear feet per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch wide flanged suction opening are shown in the following table:

Welding zone	Minimum air flow [1] cubic feet/minutes	Duct diameter, inches [2]
4 to 6 inches from arc or torch	150	3
6 to 8 inches from arc or torch	275	3½
8 to 10 inches from arc or torch	425	4½
10 to 12 inches from arc or torch	600	5½

[1] When brazing with cadmium bearing materials or when cutting on such materials increased rates of ventilation may be required.

[2] Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.

(ii) *Fixed enclosure.* A fixed enclosure with a top and not less than two sides which surround the welding or cutting operations and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet per minute.

(4) *Ventilation in confined spaces*—(i) *Air replacement.* All welding and cutting operations carried on in confined spaces shall be adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air replacing that withdrawn shall be clean and respirable.

(ii) *Airline respirators.* In such circumstances where it is impossible to provide such ventilation, airline respirators or hose masks approved by the U.S. Bureau of Mines for this purpose shall be used.

(iii) *Self-contained units.* In areas immediately hazardous to life, hose masks with blowers or self-contained breathing equipment shall be used. The breathing equipment shall be approved by the U.S. Bureau of Mines.

(iv) *Outside helper.* Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, hose masks with blowers or self-contained breathing equipment approved by the U.S. Bureau of Mines, a worker shall be stationed on the outside of such confined spaces to insure the safety of those working within.

(v) *Oxygen for ventilation.* Oxygen shall never be used for ventilation.

(5) *Fluorine compounds*—(i) *General.* In confined spaces, welding or cutting involving fluxes, coverings, or other materials which contain fluorine compounds shall be done in accordance with subparagraph (4) of this paragraph. A fluorine compound is one that contains fluorine, as an element in chemical combination, not as a free gas.

(ii) *Maximum allowable concentration.* The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, experience has shown such protection to be desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that the fluorides liberated are below the maximum allowable concentration, such protection is not necessary.

(6) *Zinc*—(i) *Confined spaces.* In confined spaces welding or cutting involving zinc-bearing base or filler metals or metals coated with zinc-bearing materials shall be done in accordance with subparagraph (4) of this paragraph.

(ii) *Indoors.* Indoors, welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials shall be done in accordance with subparagraph (3) of this paragraph.

(7) *Lead*—(i) *Confined spaces.* In confined spaces, welding involving lead-base metals (erroneously called lead-burning) shall be done in accordance with subparagraph (4) of this paragraph.

(ii) *Indoors.* Indoors, welding involving lead-base metals shall be done in accordance with subparagraph (3) of this paragraph.

(iii) *Local ventilation.* In confined spaces or indoors, welding or cutting involving metals containing lead, other than as an impurity, or involving metals coated with lead-bearing materials, including paint shall be done using local exhaust ventilation or airline respirators. Outdoors such operations shall be done using respiratory protective equipment approved by the U.S. Bureau of Mines for such purposes. In all cases, workers in the immediate vicinity of the cutting operation shall be protected as necessary by local exhaust ventilation or airline respirators.

(8) *Beryllium.* Welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals shall be done using local exhaust ventilation and airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by § 1910.93. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.

(9) *Cadmium.*—(i) *General.* Welding or cutting indoors or in confined spaces involving cadmium-bearing or cadmium-coated base metals shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by § 1910.93. Outdoors such operations shall be done using respiratory protective equipment such as fume respirators approved by the U.S. Bureau of Mines for such purposes.

(ii) *Confined space.* Welding (brazing) involving cadmium-bearing filler metals shall be done using ventilation as prescribed in paragraph (3) or (4) of this paragraph if the work is to be done in a confined space.

(10) *Mercury.* Welding or cutting indoors or in a confined space involving metals coated with mercury-bearing materials including paint, shall be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by § 1910.93. Outdoors such operations shall be done using respiratory protective equipment approved by the U.S. Bureau of Mines for such purposes.

(11) *Cleaning compounds*—(i) *Manufacturer's instructions.* In the use of cleaning materials, because of their possible toxicity or flammability, appropriate precautions such as manufacturers instructions shall be followed.

(ii) *Degreasing.* Degreasing or other cleaning operations involving chlorinated hydrocarbons shall be so located that no vapors from these operations will reach or be drawn into the atmosphere surrounding any welding operation. In addition, trichloroethylene and perchlorethylene should be kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations.

(12) *Cutting of stainless steels.* Oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, shall be done using mechanical ventilation adequate to remove the fumes generated.

(13) *First-aid equipment.* First-aid equipment shall be available at all times. On every shift of welding operations there should be present employees trained to render first aid. All injuries shall be reported as soon as possible for medical attention. First aid shall be rendered until medical attention can be provided.

(g) *Industrial applications* — (1) *Transmission pipeline*—(i) *General.* The requirements of paragraphs (b), (e), and (f) of this section shall be observed.

(ii) *Field shop operations.* Where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations the requirements of paragraphs (a), (b), (d), (e), and (f) of this section shall be observed.

(iii) *Electric shock.* When arc welding is performed in wet conditions, or under conditions of high humidity, special protection against electric shock shall be supplied.

(iv) *Pressure testing.* In pressure testing of pipelines, the workers and the public shall be protected against injury by the blowing out of closures or other pressure restraining devices. Also, protection shall be provided against expulsion of loose dirt that may have become trapped in the pipe.

(v) *Construction standards.* The welded construction of transmission pipelines shall be conducted in accordance with the Standard for Welding Pipe Lines and Related Facilities, API Std. 1104–1968.

(vi) *Flammable substance lines.* The connection, by welding, of branches to pipelines carrying flammable substances shall be performed in accordance with Welding or Hot Tapping on Equipment Containing Flammables, API Std. PSD No. 2201–1963.

(vii) *X-ray inspection.* The use of X-rays and radioactive isotopes for the inspection of welded pipeline joints shall be carried out in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1–1963.

(2) *Mechanical piping systems*—(i) *General.* The requirements of paragraphs (a), (b), (d), (e), and (f) of this section shall be observed.

(ii) *X-ray inspection.* The use of X-rays and radioactive isotopes for the inspection of welded piping joints shall be in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1–1963.

§ 1910.253 Sources of standards.

Sec.	*Source*
1910.251	ANSI Z49.1–1967, Safety in Welding and Cutting.
1910.252	(a) NFPA—51–1969, Welding and Cutting Oxygen Fuel Gas Systems. (b) ANSI Z-49.1 1967, Safety in Welding and Cutting. (c) NFPA 51B 1962, Cutting and Welding Processes. (d) 41 CFR 50–204.7.

§ 1910.254 Standards organizations.

Specific standards of the following organizations have been referenced in this subpart. Copies of the referenced standards may be obtained from the issuing organizations. The names and addresses of the issuing organizations are as follows:

(a) American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.

(b) National Fire Protection Association (NFPA), 60 Batterymarch Street, Boston, MA 02110.

(c) Compressed Association, Inc., 500 Fifth Avenue, New York, NY 10036.

(d) American Petroleum Institute, 1801 K Street NW., Washington, DC 20006.

(e) American Welding Society, 444 Madison Avenue, New York, NY 10022.

(f) Rubber Manufacturers Association, 345 East 47th Street, New York, NY 10017.

Subpart R—Special Industries

§ 1910.261 Pulp, paper, and paperboard mills.

(a) *General requirements*—(1) *Application.* This section applies to establishments where pulp, paper, and paperboard are manufactured and converted. This section does not apply to logging and the transportation of logs to pulp, paper, and paperboard mills.

(2) *Standards incorporated by reference.* Standards covering issues of occupational safety and health which have general application without regard to any specific industry are incorporated by reference in paragraphs (b) through (m) of this section and in subparagraphs (3) and (4) of this paragraph and made applicable under this section. Such standards shall be construed according to the rules set forth in § 1910.5.

(3) *General incorporation of standards.* Establishments subject to this section shall comply with the following standards of the American National Standards Institute:

(i) Practice for Industrial Lighting, A11.1—1965 (R–1970).

(ii) Safety Requirements for Floor and Wall Openings, Railings, and Toe Boards, A12.1—1967.

(iii) Scheme for the Identification of Piping Systems, A13.1—1956.

(iv) Safety Code for Portable Wood Ladders, A14.1—1968.

(v) Safety Code for Portable Metal Ladders, A14.2—1956.

(vi) Safety Code for Fixed Ladders, A14.3—1956.

(vii) Safety Code for Elevators, Dumbwaiters, and Moving Walks, A17.1—1965, including Supplements A17.1a—1967, A17.1b—1968, A17.1c—1969, and A17.1d—1970.

(viii) Practice for the Inspection of Elevators (Inspector's Manual), A17.2—1960, including Supplements A17.2a—1965 and A17.2b—1967.

(ix) Safety Code for Mechanical Power-Transmission Apparatus, B15.1—1953 (Reaffirmed 1958).

(x) Safety Code for Conveyors, Cableways, and Related Equipment, B20.1—1957.

(xi) Safety Code for Cranes, Derricks, and Hoists, B30.2—1943 (Reaffirmed 1952 and partially revised by B30.2.0—1967 and B30.5—1968).

(xii) Overhead and Gantry Cranes, B30.2.0—1967 (Partial Revision of B30.2—1943).

(xiii) Crawler, Locomotive, and Truck Cranes, B30.5—1968 (Partial Revision of B30.2—1943).

(xiv) Power Piping, B31.1.0—1967 and addenda B31.10a—1969. Fuel Gas Piping, B31.2—1968.

(xv) Safety Code for Powered Industrial Trucks, B56.1—1969.

(xvi) Identification of Gas-Mask Canisters, K13.1—1967.

(xvii) Safety Code for Woodworking Machinery, O1.1—1954 (Reaffirmed 1961).

(xviii) Requirements for Sanitation in Places of Employment, Z4.1—1968.

(xix) Safety Code for Ventilation and Operation of Open-Surface Tanks, Z9.1—1951.

(xx) Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2—1960.

(xxi) Prevention of Sulfur Fires and Explosions, Z12.12—1968.

(xxii) Method of Measurement of Real-Ear Attenuation of Ear Protectors at Threshold, Z24.22—1957.

(xxiii) Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying, Z33.1—1961.

(xxiv) Specifications for Accident Prevention Signs, Z35.1—1968.

(xxv) Practice for Occupational and Educational Eye and Face Protection, Z87.1—1968 (Partial Revision of Z2.1—1959).

(xxvi) Practices for Respiratory Protection, Z88.2—1969.

(xxvii) Safety Requirements for Industrial Head Protection, Z89.1—1969.

(4) *Other standards.* The following standards shall be considered standards under this section:

(i) ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, including addenda 1969.

(ii) Building Exits Code for Life Safety from Fire, NFPA 101—1970.

(iii) Safety in the Handling and Use of Explosives, IME Pamphlet No. 17, July 1960, Institute of Makers of Explosives.

(b) *Safe practices*—(1) *Guards.* All driving mechanisms, power-transmission apparatus, and prime movers shall be constructed, guarded, and used in conformity with American National Standard B15.1—1963 (Reaffirmed 1958).

(2) *Personal protective clothing and equipment.* Foot protection, shin-guards, hard hats, noise attenuation devices, or other personal protective clothing and equipment shall be worn when the extent of the hazard is such as to warrant their use. Such equipment shall be worn whenever specifically required by other paragraphs of this section. All equipment shall be maintained in accordance with applicable American National Standards. Respirators, goggles, and protective masks, rubber gloves, rubber boots, and other such equipment shall be cleaned and disinfected before being used by another employee. Eye, head, respiratory, and ear protection, where specified, shall conform to American National Standards Z24.22—1957, Z87.1—1968, Z88.2—1969, and Z89.1—1969.

(3) *Floors and platforms.* Floors, platforms, and work surfaces shall be maintained in accordance with American National Standard A12.1—1967.

(4) *Lockouts.* Devices such as padlocks shall be provided for locking out the source of power at the main disconnect switch. Before any maintenance, inspection, cleaning, adjusting, or servicing of equipment (electrical, mechanical, or

other) that requires entrance into or close contact with the machinery or equipment, the main power disconnect switch or valve, or both, controlling its source of power or flow of material, shall be locked out or blocked off with padlock, blank flange, or similar device.

(5) *Vessel entering.* Lifelines and safety harness shall be worn by anyone entering closed vessels, tanks, chip bins, and similar equipment, and a person shall be stationed outside in a position to handle the line and to summon assistance in case of emergency. The air in the vessels shall be tested for oxygen deficiency and the presence of both toxic and explosive gases and vapors, before entry into closed vessels, tanks, etc., is permitted. Self-contained air- or oxygen-supply masks shall be readily available in case of emergency. Work shall not be done on equipment under conditions where an injury would result if a valve were unexpectedly opened or closed unless the valve has been locked in a safe position.

(6) *Industrial power trucks.* All industrial power truck operations shall conform to American National Standard B56.1-1969. All forklift trucks shall be provided with overhead guards. All guards shall be designed in compliance with American National Standard B56.1—1969. Design requirements shall provide protection for the liquid petroleum tank.

(7) *Emergency lighting.* Emergency lighting shall be provided wherever it is necessary for employees to remain at their machines or stations to shut down equipment in case of power failure. Emergency lighting shall be provided at stairways and passageways or aisleways used by employees for emergency exit in case of power failure. Emergency lighting shall be provided in all plant first aid and medical facilities.

(c) *Handling and storage of pulpwood and pulp chips*—(1) *Handling pulpwood with forklift trucks.* Where large forklift trucks, or lift trucks with clam-jaws, are used in the yard, the operator's enclosed cab shall be provided with an escape hatch, whenever the hydraulic arm blocks escape through the side doors.

(2) *Handling pulpwood with cranes or stackers.* (i) Where locomotive cranes are used for loading or unloading pulpwood, the pulpwood shall be piled so as to allow a clearance of not less than 24 inches between the pile and the end of the cab of any locomotive crane in use, when the cab is turned in any working position.

(ii) The minimum distance of the pulpwood pile from the centerline of a standard-gage track shall be maintained at not less than 8½ feet.

(iii) Logs shall be piled in an orderly and stable manner, with no projection into walkways or roadways.

(iv) Railroad cars shall not be spotted on tracks adjacent to the locomotive cranes unless a 24-inch clearance is maintained, as required in subdivision (i) of this subparagraph.

(v) The handling and storage of other materials shall conform to subdivisions (i) and (ii) of this subparagraph with respect to clearance.

(vi) Equipment and practices shall conform to American National Standards B30.2—1943 (Reaffirmed 1952) and B30.2.0—1967.

(vii) Personal protective equipment for such uses as foot, head, and eye protection shall be required for workers on a job basis.

(viii) No person shall be permitted to walk beneath a suspended load, bucket, or hook.

(3) *Handling pulpwood from ships.* (i) Ladders and gangplanks with railings to boat docks shall meet the requirements of American National Standards A12.1—1967, A14.1—1968, A14.2—1956, and A14.3—1956, and shall be securely fastened in place.

(ii) The hatch tender shall be required to signal the hoisting engineer to move the load only after the men working in the hold are in the clear.

(iii) The air in the ship's hold, tanks, or closed vessels shall be tested for oxygen deficiency and for both toxic and explosive gases and vapors.

(4) *Handling pulpwood from flatcars and all other railway cars.* (i) Railroad flatcars for the conveyance of pulpwood loaded parallel to the length of the car shall be equipped with safety-stake pockets.

(ii) Where pulpwood is loaded crosswise on a flatcar sufficient stakes of sizes not smaller than 4 by 4 inches shall be used to prevent the load from shifting.

(iii) When it is necessary to cut stakes, those on the unloading side should be partially cut through first, and then the binder wires cut on the opposite side. Wire cutters equipped with long extension handles shall be used. No person shall be permitted along the dumping side of the car after the stakes have been cut.

(iv) When steel straps without stakes are used, the steel straps shall be cut from a safe area to prevent employees from being struck by the falling logs.

(v) Flatcars and all other cars shall be chocked during unloading. Where equipment is not provided with hand brakes, rail clamping chocks shall be used.

(vi) A derail shall be used to prevent movement of other rail equipment into cars where persons are working.

(5) *Handling pulpwood from trucks.* (i) Cutting of stakes and binder wires shall be done in accordance with subparagraph 4(iii) of this paragraph.

(ii) Where binder chain and steel stakes are used, the binder chains shall be released and the stakes tripped from the opposite side of the load spillage.

(iii) Where binder chains and crane slings are used, the crane slings shall be attached and taut before the binder chains are released. The hooker shall see that the helper is clear before signaling for the movement of the load.

(6) *Handling pulp chips from railway cars.* (i) All cars shall be securely fastened in place and all employees in the clear before dumping is started.

(ii) Personal protective equipment for such uses as foot, head, and eye protection shall be provided, and employees shall wear the equipment when working in the woodyard. Ear protection shall be provided when the noise level may be harmful.

(7) *Handling pulp chips from trucks and trailers.* (i) All trucks and trailers shall be securely fastened in place and all employees in the clear before dumping is started.

(ii) Personal protective equipment shall be in accordance with subparagraph (6)(ii) of this paragraph.

(8) *Cranes.* (i) Crane boom and load capacities as specified by the manufacturer shall be posted in the cab of the crane in accordance with American National Standards B30.2—1943 (reaffirmed 1968) and B30.2.0—1967.

(ii) A safety device such as a heavy chain or cable at least equal in strength to the lifting cables shall be fastened to the boom and to the frame of the boom crane (if it is other than locomotive) at the base. Alternatively, a telescoping safety device shall be fastened to the boom and to the cab frame, so as to prevent the boom from snapping back over the cab in the event of lifting cable breakage.

(iii) A crane shall not be operated where any part thereof may come within 10 feet of overhead powerlines (or other overhead obstructions) unless the powerlines have been deenergized. The boom shall be painted bright yellow from and including the head sheave to a point 6 feet down the boom towards the cab.

(iv) Standard signals for the operation of cranes shall be established for all movements of the crane, in accordance with American National Standards B30.2—1943 (reaffirmed 1968) and B30.2.0—1967.

(v) Only one member of the crew shall be authorized to give signals to the crane operator.

(vi) All cranes shall be equipped with a suitable warning device such as a horn or whistle.

(vii) A sheave guard shall be provided beneath the head sheave of the boom.

(9) *Traffic warning signs or signals.* (i) A flagman shall direct the movement of cranes or locomotives being moved across railroad tracks or roads, and at any points where the vision of the operator is restricted. The flagman must always remain in sight of the operator when the crane or locomotive is in motion. The blue flag policy shall be used to mark stationary cars day and night. This policy shall include marking the track in advance of the spotted cars (flag for daytime, light for darkness).

(ii) After cars are spotted for loading or unloading, warning flags or signs shall be placed in the center of the track at least 50 feet away from the cars and a derail set to protect workmen in the car.

(10) *Illumination.* Artificial illumination shall be provided when loading or unloading is performed after dark, in accordance with American National Standard A11.1—1965 (R—1970).

(11) *Bridge or dock plates.* The construction and use of bridge or dock plates shall conform to requirements of American National Standard B56.1—1969.

(12) *Barking devices.* When barking drums are employed in the yard, the requirements of paragraph (e)(12) of this section shall apply.

(13) *Hand tools.* Handles of wood hooks shall be locked to the shank to prevent them from rotating.

(14) *Removal of pulpwood.* (i) The ends of a woodpile shall be properly sloped and cross-tiered into the pile. Upright poles shall not be used at the ends of woodpiles. To knock down wood from the woodpile, mechanical equipment shall be used to permit employees to keep in the clear of loosened wood.

(ii) If dynamite is used to loosen the pile, only authorized personnel shall be permitted to handle and discharge the explosive. An electric detonator is preferable for firing; if a fuse is used, it shall be an approved safety fuse with a burning rate of not less than 120 seconds per yard and a minimum length of 3 feet, in accordance with Safety in the Handling and Use of Explosives, IME Pamphlet No. 17, July 1960.

(15) *Belt conveyors.* (i) The sides of the conveyor shall be constructed so that the wood will not fall off.

(ii) Where conveyors cross passageways or roadways, a horizontal platform shall be provided under the conveyor extending out from the sides of the conveyor a distance equal to 1½ times the length of the wood handled. The platform shall extend the width of the road plus 2 feet on each side and shall be kept free of wood and rubbish. The edges of the platform shall be provided with toeboards or other protection to prevent wood from falling, in accordance with American National Standard A12.1—1967.

(iii) All conveyors for pulpwood shall have the inrunning nips between chain and sprockets guarded; also, turning drums shall be guarded.

(iv) Every belt conveyor shall have an emergency stop cable extending the length of the conveyor so that it may be stopped from any location along the line, or conveniently located stop buttons within 10 feet of each work station, in accordance with American National Standard B20.1—1957.

(16) *Signs.* Where conveyors cross walkways or roadways in the yards, signs reading "Danger—Overhead Conveyor" or an equivalent warning shall be erected, in accordance with American National Standard Z35.1—1968.

(d) *Handling and storage of raw materials other than pulpwood or pulp chips*—(1) *Personal protective equipment.* (i) Whenever possible, all dust, fumes, and gases incident to handling materials shall be controlled at the source, in accordance with American National Standard Z9.2—1960. Where control at the source is not possible, respirators with goggles or protective masks shall be provided, and employees shall wear them when handling alum, clay, soda ash, lime, bleach powder, sulfur, chlorine, and similar materials, and when opening rag bales.

(ii) When handling liquid acid or alkali, workmen shall be provided with approved eye and face protection and protective clothing, in accordance with American National Standard Z87.1—1968.

(2) *Clearance.* (i) When materials are being piled inside a building and upon platforms, an aisle clearance at least 3 feet greater than the widest truck in use shall be provided.

(ii) Baled paper and rags stored inside a building shall not be piled closer than 18 inches to walls, partitions, or sprinkler heads.

(3) *Piling and unpiling pulp.* (i) Piles of wet lap pulp (unless palletized) shall be stepped back one-half the width of the sheet for each 8 feet of pile height. Sheets of pulp shall be interlapped to make the pile secure. Pulp shall not be piled over pipelines to jeopardize pipes, or so as to cause overloading of floors, or to within 18 inches below sprinkler heads.

(ii) Piles of pulp shall not be undermined when being unpiled.

(iii) Floor capacities shall be clearly marked on all floors.

(4) *Chocking rolls.* (i) Where pulp or paper rolls are of uniform size, cribbing should be constructed to keep rolls from moving.

(ii) Where rolls are pyramided two or more high, chocks shall be installed between each roll on the floor and at every row. The face of each chock should be formed on a radius to conform to the average roll size in use. Where pulp and paper rolls are stored on smooth floors in processing areas, rubber chocks with wooden core shall be used.

(iii) When rolls are decked two or more high, the bottom rolls shall be chocked on each side to prevent shifting in either direction.

(iv) A supply of portable roll chocks should be available to be used where there are gaps in the bottom row of rolls. These should be as light as possible while still providing maximum blocking effect.

(e) *Preparing pulpwood*—(1) *Gang and slasher saws.* A guard shall be provided in front of all gang and slasher saws to protect workers from wood thrown by saws. A guard shall be placed over tail sprockets.

(2) *Slasher tables.* Saws shall be stopped and power switches shall be locked out and tagged whenever it is necessary for any person to be on the slasher table.

(3) *Slasher drive belts, pulleys, and shafts.* All belts, pulleys, and shafts shall be guarded in accordance with American National Standard B15.1—1955 (Reaffirmed 1958).

(4) *Runway to the jack ladder.* The runway from the pond or unloading dock to the table shall be protected with standard handrails and toeboards. Inclined portions shall have cleats or equivalent nonslip surfacing, in accordance with American National Standard A12.1—1967. Protective equipment shall be provided for persons working over water.

(5) *Guards below table.* Where not protected by the frame of the machine, the underside of the slasher saws shall be enclosed with guards.

(6) *Conveyors.* The requirements of paragraph (c)(15)(iv) of this section shall apply.

(7) *Circular saws (not slasher saws).* Saws shall be provided with standard guards, in accordance with American National Standard 01.1—1954 (Reaffirmed 1961).

(8) *Barker feed.* Each barker shall be equipped with a feed and turnover device which will make it unnecessary for the operator to hold a bolt or log by hand during the barking operation. Eye, ear, and head protection shall be provided for the operator, in accordance with paragraph (b)(2) of this section.

(9) *Guards.* A guard shall be installed around barkers to confine flying particles, in accordance with American National Standard B15.1—1953 (Reaffirmed 1958).

(10) *Stops.* All control devices shall be locked out and tagged when knives are being changed.

(11) *Speed governor.* Water wheels, when directly connected to marker disks or grinders, shall be provided with speed governors, if operated with gate wide open.

(12) *Continuous barking drums.* (i) When platforms or floors allow access to the sides of the drums, a standard railing shall be constructed around the drums. When two or more drums are arranged side by side, proper walkways with standard handrails shall be provided between each set, in accordance with paragraph (b)(3) of this section.

(ii) Sprockets and chains, gears, and trunnions shall have standard guards, in accordance with paragraph (b)(1) of this section.

(iii) Whenever it becomes necessary for a workman to go within a drum, the driving mechanism shall be locked and tagged, at the main disconnect switch, in accordance with paragraph (b)(4) of this section.

(13) *Intermittent barking drums.* In addition to motor switch, clutch, belt shifter, or other power disconnecting device, intermittent barking drums shall be equipped with a device which may be locked to prevent the drum from moving while it is being emptied or filled.

(14) *Hydraulic barkers.* Hydraulic barkers shall be enclosed with strong baffles at the inlet and the outlet. The operator shall be protected by at least five-ply laminated glass.

(15) *Splitter block.* The block upon or against which the wood is rested shall have a corrugated surface or other means provided that the wood will not slip. Wood to be split, and also the splitting block, shall be free of ice, snow, or chips. The operator shall be provided with eye and foot protection. A clear and unobstructed view shall be maintained between equipment and workers around the block and the workers' help area.

(16) *Power control.* Power for the operation of the splitter shall be controlled by a clutch or equivalent device.

(17) *Knot cleaners.* The operators of knot cleaners of the woodpecker type shall wear eye protection equipment. Knot cleaners of the woodpecker type

should be enclosed to protect passersby from flying chips.

(18) *Chipper spout.* The feed system to the chipper spout shall be arranged in such a way that the operator does not stand in a direct line with the chipper spout. All chipper spouts shall be enclosed to a height of at least 42 inches from the floor or operator's platform. If practical, a mirror should be installed to enable the chipper feeder to see the chute. When other protection is not sufficient, the operator shall wear a safety belt line. The safety belt line shall be fastened in such a manner as to make it impossible for the operator to fall into the throat of the chipper. Ear protection equipment shall be worn by the operator and others in the immediate area if there is any possibility that the noise level may be harmful (see § 1910.95).

(19) *Carriers for knives.* Carriers shall be provided and used for transportation of knives.

(f) *Rag and old paper preparation*—(1) *Ripping and trimming tools.* (i) Hand knives and scissors shall have blunt points, shall be fastened to the table with chain or thong, and shall not be carried on the person but placed safely in racks or sheaths when not in use.

(ii) Hand knives and sharpening steels shall be provided with guards at the junction of the handle and the blade.

(2) *Shredders, cutters, and dusters.* (i) Rotating heads or cylinders shall be completely enclosed except for an opening at the feed side sufficient to permit only the entry of stock. The enclosure shall extend over the top of the feed rolls. It shall be constructed either of solid material or with mesh or openings not exceeding one-half inch and substantial enough to contain flying particles and prevent accidental contact with moving parts. The enclosure shall be bolted or locked into place.

(ii) A smooth-pivoted idler roll resting on the stock or feed table shall be provided in front of feed rolls except when arrangements prevent the operator from standing closer than 36 inches to any part of the feed rolls.

(iii) Any manually fed cutter, shredder, or duster shall be provided with an idler roll as per subdivision (ii) of this subparagraph or the operator shall use special hand-feeding tools.

(iv) Hoods of cutters, shredders, and dusters shall have exhaust ventilation, in accordance with American National Standard Z9.2—1960.

(3) *Blowers.* (i) Blowers used for transporting rags shall be provided with feed hoppers having outer edges located not less than 48 inches from the fan.

(ii) The arrangement of the blower discharge outlets and work areas shall be such as to prevent material from falling on workers.

(4) *Conveyors.* Conveyors and conveyor drive belts and pulleys shall be fully enclosed or, if open and within 7 feet of the floor, shall be constructed and guarded in accordance with paragraph (c)(15) of this section and American National Standards B15.1—1953 (Reaffirmed 1958) and B20.1—1957.

(5) *Dust.* Measures for the control of dust shall be provided, in accordance with American National Standards Z33.1—1961, Z87.1—1968, and Z88.2—1969.

(6) *Rag cookers.* (i) When cleaning, inspection, or other work requires that persons enter rag cookers, all steam and water valves, or other control devices, shall be locked and tagged in the closed or "off" position. Blank flanging of pipelines is acceptable in place of closed and locked valves.

(ii) When cleaning, inspection, or other work requires that persons must enter the cooker, one person shall be stationed outside in a position to observe and assist in case of emergency, in accordance with paragraph (b)(5) of this section.

(iii) Supplied air respirators should be worn by persons when spreading material inside cookers.

(iv) Rag cookers shall be provided with safety valves in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels—1968, with Addenda.

(g) *Chemical processes of making pulp*—(1) *Sulfur burners.* (i) Sulfur-burner houses shall be safely and adequately ventilated, and every precaution shall be taken to guard against dust explosion hazards and fires, in accordance with American National Standards Z9.2—1960 and Z12.12—1968.

(ii) Nonsparking tools and equipment shall be used in handling dry sulfur.

(iii) Sulfur storage bins shall be kept free of sulfur dust accumulation, and buildings should be designed with explosion relief, in accordance with American National Standard Z9.2—1960.

(iv) Electrical equipment shall be of the explosion-proof type, in accordance with the requirements of §§ 1910.322 through 1910.328.

(v) Sulfur-melting equipment shall not be located in the burner room.

(2) *Protection for employees (acid plants).* (i) Gas masks, fitted with canisters containing absorbents for the particular acids, gases, or mists involved, shall be provided for employees of the acid department.

(ii) Supplied air respirators shall be strategically located for emergency and rescue use.

(iii) During inspection, repairs, or maintenance of acid towers, the workman shall be provided with eye protection, a supplied air respirator, a safety belt, and an attached lifeline. The line shall be extended to an attendant stationed outside the tower opening.

(3) *Acid tower structure.* Outside elevators shall be inspected daily during winter months when ice materially affects safety. Elevators, runways, stairs, etc., for the acid tower shall be inspected monthly for defects that may occur because of exposure to acid or corrosive gases.

(4) *Tanks (acid).* (i) Tanks shall be free of acid and shall be washed out with water, and fresh air shall be blown into them before allowing men to enter. Men entering the tanks shall be provided with supplied air respirators, lifebelts, and attached lifelines.

(ii) A man shall be stationed outside to summon assistance if necessary. All intake valves to a tank shall be blanked off or disconnected.

(5) *Clothing.* Where lime slaking takes place, employees shall be provided with rubber boots, rubber gloves, protective aprons, and eye protection. A deluge shower and eye fountain shall be provided to flush the skin and eyes to counteract lime or acid burns.

(6) *Lead burning.* When lead burning is being done within tanks, fresh air shall be forced into the tanks so that fresh air will reach the face of the worker first and the direction of the current will never be from the source of the fumes toward the face of the workers. Supplied air respirators (constant-flow type) shall be provided.

(7) *Hoops for acid storage tanks.* Hoops of tanks shall be made of rods rather than flat strips and shall be safely maintained by scheduled inspections.

(8) *Chip and sawdust bins.* Steam or compressed-air lances, or other facilities, shall be used for breaking down the arches caused by jamming in chip lofts. No worker shall be permitted to enter a bin unless provided with a safety belt, with line attached, and an attendant stationed at the bin to summon assistance.

(9) *Exits (digester building).* At least one unobstructed exit at each end of the room shall be provided on each floor of a digester building.

(10) *Gas masks (digester building).* Gas masks shall be available. These masks shall furnish adequate protection against sulfurous acid and chlorine gases, and shall be inspected and tested at frequent intervals, not to exceed 1 month, in accordance with American National Standards Z87.1—1968, and Z88.2—1969.

(11) *Elevators.* (i) Elevators shall be constructed in accordance with American National Standard A17.1–1965.

(ii) Elevators shall be equipped with gas masks for the maximum number of passengers.

(iii) Elevators shall be equipped with an alarm system to advise of failure.

(12) *Blowoff valves and piping.* (i) The blowoff valve of a digester shall be arranged so as to be operated from another room, remote from safety valves.

(ii) Through bolts instead of cap bolts shall be used on all digester pipings.

(iii) Heavy duty pipe, valves, and fittings shall be used between the digester and blow pit. These valves, fittings, and pipes shall be inspected at least semiannually to determine the degree of deterioration and should be replaced when necessary.

(iv) Digester blow valves shall be pinned or locked in closed position throughout the entire cooking period.

(13) *Blow pits and blow tanks.* (i) Blow-pit openings shall be preferably on the side of the pit instead of on top. When located on top, openings shall be as small as possible and shall be provided with railings, in accordance with American National Standard A12.1—1967.

(ii) A specially constructed ladder shall be used for access to blow pits, to be constructed so that the door of the blow pit cannot be closed when the ladder is in place; other means shall be provided to prevent the closing of the pit door when anyone is in the pit.

(iii) A signaling device shall be installed in the digester and blow-pit rooms and chip bins to be operated as a warning before and while digesters are being blown.

(iv) Blow-pit hoops shall be maintained in a safe condition.

(14) *Blowing digester.* (i) Blowoff valves shall be opened slowly.

(ii) After the digester has started to be blown, the blowoff valve shall be left open, and the hand plate shall not be removed until the digester cook signals the blow-pit man that the blow is completed. Whenever it becomes necessary to remove the hand plate to clear stock, operators shall wear eye protection equipment and protective clothing to guard against burns from hot stock.

(iii) Means shall be provided whereby the digester cook shall signal the man in the chip bin before starting to load the digester.

(iv) When a digester is to be blown, or is blowing, red warning lights should be lighted, and these warning lights should be located in such a manner as to alert all personnel to leave whose duties do not require them to be in the vicinity of the digester during this operation.

(15) *Inspecting and repairing digester.* (i) Valves controlling lines leading into a digester shall be locked out and tagged. The keys to the locks shall be in the possession of a person or persons doing the inspecting or making repairs.

(ii) Fresh air shall be blown into the digester constantly while workmen are inside. Supplied air respirators shall be available in the event the fresh air supply fails or is inadequate.

(iii) No inspector shall enter a digester unless a lifeline is securely fastened to his body by means of a safety belt and at least one other experienced employee is stationed outside the digester to handle the line and to summon assistance. All ladders and lifelines shall be inspected before each use.

(iv) The concentration of lead dust in the air shall not exceed the limits specified in § 1910.93.

(v) All employees entering digesters for inspection or repair work shall be provided with protective headgear. Eye protection and dust masks shall be provided to workmen while the old brick lining is being removed, in accordance with American National Standards, Z87.1—1968, Z88.2—1969, and Z89.1—1969.

(vi) Sanitary facilities shall be provided as specified in American National Standard Z4.1—1968.

(16) *Pressure tanks-accumulators (acid).* (i) Safety regulations governing inspection and repairing of pressure tanks-accumulators (acid) shall be the same as those specified in subparagraph (15) of this paragraph.

(ii) The pressure tanks-accumulators shall be inspected twice annually. (See the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels—1968, with Addenda.)

(17) *Pressure vessels (safety devices).* (i) A safety valve shall be installed in a separate line from each pressure vessel; no hand valve shall be installed between this safety valve and the pressure vessel. Safety valves shall be checked between each cook to be sure they have not become plugged or corroded to the point of being inoperative. (See the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels—1968, with Addenda.)

(ii) All safety devices shall conform to Paragraph U–2 in the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels—1968, with Addenda.

(18) *Miscellaneous.* Insofar as the processes of the sulfate and soda operations are similar to those of the sulfite processes, the standard of subparagraphs (1) through (17) of this paragraph shall apply.

(i) Quick operating showers, bubblers, etc., shall be available for emergency use in case of caustic soda burns.

(ii) Rotary tenders, smelter operators, and those cleaning smelt spouts shall be provided with eye protection equipment (fitted with lenses that filter out the harmful rays emanating from the light source) when actively engaged in their duties, in accordance with American National Standard Z87.1—1968.

(iii) Heavy-duty pipe, valves, and fittings shall be used between digester and blow pit. These shall be inspected at least semiannually to determine the degree of deterioration and repaired or replaced when necessary, in accordance with American National Standards B31.1—1955, B31.1a—1963, B31.1.0—1967, and B31.2—1968.

(iv) Smelt-dissolving tanks shall be covered and the cover kept closed, except when samples are being taken.

(v) Smelt tanks shall be provided with vent stacks and explosion doors, in accordance with American National Standard Z9.1—1951.

(19) *Blow lines.* (i) Each digester should have two independent "gas-off" lines and a reducing valve in the high-pressure steam line with a safety valve between the digester and the reducing valve. Two gas-off lines are recommended so that if one plugs with pulp, the other may be used, and the hazard of unplugging with the digester under pressure overcome. With the installation of a reducing valve and a safety valve, it is improbable that pressure will exceed the maximum allowable working pressure of the digester.

(ii) Where the blow-off lines from several digesters lead into one pipe, the handles of all cocks should be set uniformly, or some equivalent arrangement should be provided so that a man can see at a glance whether all cocks are set right or not. If valves instead of cocks are provided, a type with a rising spindle should be used.

(iii) When blow lines from more than one digester lead into one pipe, the cock or valve of the blow line from the tank being inspected or repaired shall be locked or tagged out, or the line shall be disconnected and blocked off.

(20) *Furnace room.* Exhaust ventilation shall be provided where niter cake is fed into a rotary furnace and shall be so designed and maintained as to keep the concentration of hydrogen sulfide gas below the parts per million listed in § 1910.93.

(21) *Inspection and repair of tanks.* All piping leading to tanks shall be blanked off or valved and locked or tagged. Any lines to sewers shall be blanked off to protect workers from air contaminants.

(22) *Welding.* Welding on blow tanks, accumulator tanks, or any other vessels where turpentine vapor or other combustible vapor could gather shall be done only after the vessel has been completely purged of fumes. Fresh air shall be supplied workers inside of vessels.

(23) *Turpentine systems and storage tanks.* Nonsparking tools and ground hose shall be used when pumping out the tank. The tank shall be surrounded by a berm or moat.

(h) *Bleaching*—(1) *Bleaching engines.* Bleaching engines, except the Bellmer type, shall be completely covered on the top, with the exception of one small opening large enough to allow filling but too small to admit a man. This opening should be covered by a door and guarded with standard guardrail and toeboards. Platforms leading from one engine to another shall have standard guardrails, in accordance with American National Standard A12.1—1967.

(2) *Bleach mixing rooms.* (i) The room in which the bleach powder is mixed shall be provided with adequate exhaust ventilation, located at the floor level, in accordance with American National Standard Z9.1—1951.

(ii) Chlorine gas shall be carried away from the work place and breathing area by an exhaust system. The gas shall be rendered neutral or harmless before being discharged into the atmosphere. The requirements of American National Standard Z9.2—1960 shall apply to this subdivision.

(iii) Gas masks shall be provided for emergency use, in accordance with American National Standards K13.1—1967 and Z88.2—1969.

(iv) For emergency and rescue work, independent self-contained oxygen masks or supplied air equipment shall be provided. (See American National Standards Z88.2—1969.)

(3) *Liquid chlorine.* (i) Tanks of liquid chlorine shall be stored in an adequately ventilated unoccupied room, where their possible leakage cannot affect workers.

(ii) Gas masks capable of absorbing chlorine shall be supplied, conveniently placed, and regularly inspected, and workers who may be exposed to chlorine gas shall be instructed in their use.

(iii) For emergency and rescue work, independent self-contained oxygen-type masks or supplied air equipment shall be provided.

(iv) At least two exits, remote from each other, shall be provided for all rooms in which chlorine is stored.

(v) Spur tracks upon which tank cars containing chlorine and caustic are spotted and connected to pipelines shall be protected by means of a derail in front of the cars. Blue flag policy should be invoked, in accordance with paragraph (c)(9) of this section.

(vi) All chlorine, caustic, and acid lines shall be marked for positive identification, in accordance with American National Standard A13.1—1967.

(4) *Bagged or drummed chemicals.* Bagged or drummed chemicals require efficient handling to prevent damage and spillage. Certain oxidizing chemicals used in bleaching pulp and also in some sanitizing work require added precautions for safety in storage and handling. In storage, these chemicals must be isolated from combustible materials and other chemicals with which they will react, such as acids. They must also be kept dry, clean and uncontaminated.

(i) *Mechanical pulp process*—(1) *Pulp grinders.* (i) Water wheels directly connected to pulp grinders shall be provided with speed governors limiting the peripheral speed of the grinder to that recommended by the manufacturer.

(ii) Doors of pocket grinders shall be arranged so as to keep them from closing accidentally.

(2) *Butting saws.* Hood guards shall be provided on butting saws, in accordance with American National Standard O1.1—1954 (reaffirmed 1961).

(3) *Floors and platforms.* The requirements of paragraph (b)(3) of this section shall apply.

(4) *Personal protection.* Persons exposed to falling material shall wear eye, head, foot, and shin protection equipment, in accordance with American National Standards Z87.1—1968, Z88.2—1969, Z89.1—1969, and Z41.1—1967.

(j) *Stock preparation* — (1) *Pulp shredders.* (i) Cutting heads shall be completely enclosed except for an opening at the feed side sufficient to permit only entry of stock. The enclosure shall be bolted or locked in place. The enclosure shall be of solid material or with mesh or other openings not exceeding one-half inch.

(ii) Either a slanting feed table with its outer edge not less than 36 inches from the cutting head or an automatic feeding device shall be provided.

(iii) Repairs for cleaning of blockage shall be done only when the shredder is shutdown and control devices locked.

(iv) All power-driven mechanisms shall be guarded in accordance with paragraph (b)(1) of this section.

(2) *Pulp conveyors.* Pulp conveyors and conveyor drive belts and pulleys shall be fully enclosed, or if open and within 7 feet of the floor, shall be constructed and guarded in accordance with American National Standard B20.1—1957.

(3) *Floors, steps, and platforms.* The requirements of paragraph (b)(3) of this section shall apply.

(4) *Beaters.* (i) Beater rolls shall be provided with covers.

(ii) Guard rails 42 inches high shall be provided around beaters where tub tops are less than 42 inches from the floor, in accordance with paragraph (b)(3) of this section and American National Standard A12.1—1967.

(iii) When cleaning, inspecting, or other work requires that persons enter the beaters, all control devices shall be locked or tagged out, in accordance with paragraph (b)(4) of this section.

(iv) When beaters are fed from floor above, the chute opening, if less than 42 inches from the floor, shall be provided with a complete rail or other enclosure. Openings for manual feeding shall be sufficient only for entry of stock and shall be provided with at least two permanently secured crossrails, in accordance American National Standard A12.1—1967.

(v) When beaters are fed manually from the floor above, conveniently located emergency stop devices should be provided at the top level.

(vi) Floors around beaters shall be provided with sufficient drainage to remove wastes.

(5) *Pulpers.* (i) All pulpers having the top or any other opening of vessel less than 42 inches from the floor or work platform shall have such openings guarded by railed or other enclosures. For manual charging, openings shall be sufficient only to permit the entry of stock and shall be provided with at least two permanently secured crossrails, in accordance with American National Standard A12.1—1967.

(ii) When cleaning, inspecting, or other work requires that persons enter the pulpers, they shall be equipped with safety belt and lifeline, and one person shall be stationed outside at a position to observe and assist in case of emergency.

(iii) When cleaning, inspecting, or other work requires that persons enter pulpers, all steam, water, or other control devices shall be locked or tagged out. Blank flanging and tagging of pipe lines is acceptable in place of closed and locked or tagged valves. Blank flanging of steam and water lines shall be acceptable in place of valve locks.

(iv) All power mechanisms shall be guarded in accordance with American National Standard B15.1—1953 (reaffirmed 1958).

(6) *Stock chests.* (i) All control devices shall be locked or tagged out when persons enter stock chests, in accordance with paragraph (b)(4) of this section.

(ii) All power mechanisms shall be guarded in accordance with paragraph (b)(1) of this section.

(iii) When cleaning, inspecting, or other work requires that persons enter stock chests, they shall be provided with a low-voltage extension light.

(k) *Machine room*—(1) *Emergency stops.* Paper machines shall be equipped with devices that will stop the machine quickly in an emergency. The devices shall consist of push buttons for electric motive power (or electrically operated engine stops), pull cords connected directly to the prime mover, control clutches, or other devices, interlocked with adequate braking action. The devices shall be tested periodically by making use of them when stopping the machine and shall be so located that any person working on the machine can quickly disconnect the machine from the source of power in case of emergency.

(2) *Drives.* (i) All drives, pulleys, couplings, and shafts on equipment requiring service while operating shall have standard guards in accordance with paragraph (b)(1) of this section.

(ii) All drives shall be provided with lockout devices at the power switch which interrupts the flow of current to the unit.

(iii) All ends of rotating shafts including dryer drum shafts shall be completely guarded.

(iv) All accessible disengaged doctor blades should be covered.

(v) All exposed shafts shall be guarded. Crossovers shall be provided.

(vi) Oil cups and grease fittings shall be placed in a safe area remote from nip and heat hazards.

(3) *Protective equipment.* Face shields, aprons, and rubber gloves shall be provided for workmen handling acids in accordance with paragraphs (b)(2) and (d)(1) of this section.

(4) *Walkways.* Steps and footwalks along the fourdrinier and press section shall have nonslip surfacing and be complete with standard handrails, when practical, in accordance with paragraph (b)(3) of this section.

(5) *Floor openings.* All flush floor openings in the bottom of the wire pit should be guarded with a barrier-type guard.

(6) *Steps.* Steps of uniform rise and tread with nonslip surfaces shall be provided at each press in accordance with American National Standard A12.1—1967.

(7) *Plank walkways.* A removable plank shall be provided along each press, with standard guardrails installed. The planks shall have nonslip surfaces in accordance with paragraph (b)(3) of this section.

(8) *Dryer lubrication.* If a gear bearing must be oiled while the machine is in operation, an automatic oiling device to protect the oiler shall be provided, or oil cups and grease fittings shall be placed along the walkways out of reach of hot pipes and dryer gears.

(9) *Levers.* All levers carrying weights shall be constructed so that weights will not slip or fall off.

(10) *First dryer.* Either a permanent guardrail or apron guard or both shall be installed in front of the first dryer in each section in accordance with paragraph (b)(1) of this section.

(11) *Steam and hot-water pipes.* All exposed steam and hot-water pipes within 7 feet of the floor or working platform or within 15 inches measured horizontally from stairways, ramps, or fixed ladders shall be covered with an insulating material, or guarded in such manner as to prevent contact.

(12) *Dryer gears.* Dryer gears shall be guarded excepting where the oilers' walkway is removed out of reach of the

gears' nips and spokes and hot pipes in accordance with American National Standard B15.1—1953 (reaffirmed 1958).

(13) *Broke hole.* (i) A guardrail shall be provided at broke holes in accordance with American National Standard A12.1—1967.

(ii) Where pulpers are located directly below the broke hole on a paper machine and where the broke hole opening is large enough to permit a worker to fall through, any employee pushing broke down the hole shall wear a safety belt attached to a safety belt line. The safety belt line shall be fastened in such a manner that it is impossible for the person to fall into the pulper.

(iii) An alarm bell or a flashing light shall be actuated before dropping material through the broke hole.

(14) *Feeder belt.* A feeder belt or other effective device shall be provided for starting paper through the calendar stack.

(15) *Steps.* Steps or ladders of uniform rise and tread with nonslip surfaces shall be provided at each calendar stack. Handrails and hand grips shall be provided at each calendar stack in accordance with American National Standard A12.1—1967.

(16) *Grounding.* All calendar stacks and spreader bars shall be grounded as protection against shock induced by static electricity in accordance with the requirements of § 1910.314.

(17) *Sole plates.* All exposed sole plates between dryers, calenders, reels, and rewinders shall have a nonskid surface.

(18) *Nip points.* The hazard of the nip points on all calender rolls shall be eliminated or minimized by means of an effective barrier device, or by feeding the paper into the rolls by means of a rope carrier, air jets, or hand feeding devices. Nips where paper is not being fed into the calender should be protected by barriers. Adequate nip warning signs should be used at all nip points that cannot be guarded physically.

(19) *Platforms.* (i) A nonslip walkway with standard handrail should be provided on both sides of the stacks, in accordance with the American National Standard A12.1—1967.

(ii) A nonslip platform should also be provided at the top of the calender stack if access to that area is required for changing rolls.

(20) *Scrapers.* Alloy steel scrapers with pullthrough blades approximately 3 by 5 inches in size shall be used to remove "scabs" from calender rolls.

(21) *Illumination.* Permanent lighting shall be installed in all areas where employees are required to make machine adjustments and sheet transfers in accordance with the American National Standard A11.1—1965 (R 1970).

(22) *Control panels.* Floor stand panels should be protected from being hit by moving equipment. All control panel handles and buttons shall be protected from accidental contact.

(23) *Space between reels.* On stack reels, a clearance of at least 8 inches between the reels of paper shall be maintained.

(24) *Lifting reels.* (i) The reels shall stop rotating before being lifted from bearings.

(ii) All lifting equipment (clamps, cables, and slings) shall be maintained in a safe condition and inspected regularly.

(iii) Reel shafts with square block ends shall be guarded.

(25) *Feeder belts.* Feeder belts, carrier ropes, air carriage, or other equally effective means shall be provided for starting paper into the nip or drum-type reels.

(26) *Inrunning nip.* (i) Where the nipping points of all drum winders and rewinders is on the operator's side, it shall be guarded by barrier guards interlocked with the drive mechanism.

(ii) A zero speed switch should be installed to prevent the guard from being raised while the roll is turning.

(27) *Core collars.* Set screws for securing core collars to winding and unwinding shafts shall not protrude above the face of the collar. All edges of the collar with which an operator's hand comes in contact shall be beveled to remove all sharp corners.

(28) *Slitter knives.* Slitter knives shall be guarded so as to prevent accidental contact. Carriers shall be provided and used for transportation of slitter knives.

(29) *Winder shaft.* All shafts should be equipped with a winder collar guide. The winder shall have a guide rail to align the shaft for easy entrance into the opened rewind shaft bearing housings. If the winder is large and the rewind shafts are too heavy for manual insertion, powered rewind shaft injectors should be employed.

(30) *Core shaft.* When the core shaft weighs in excess of the safe standard, a mechanical device such as a dolly shall be provided for carrying all or part of the weight when it is being removed from the set of paper and placed in the dressing brackets on the winder. In the event that the force required to extract the shaft from the cores is excessive, even though the weight of the shaft is being supported, a powered shaft puller should be employed to relieve the operator of physical strain.

(31) *Winder area.* A nonskid surface shall be provided in the front vicinity of the winder to prevent accidental slipping.

(32) *Radiation.* Special standards regarding the use of radiation equipment shall be posted and followed as required by § 1910.96.

(l) *Finishing room*—(1) *Cleaning rolls.* Rolls shall be cleaned only on the outrunning side.

(2) *Emergency stops.* Electrically or manually operated quick power disconnecting devices, interlocked with braking action, shall be provided on all operating sides of the machine within easy reach of all employees. These devices shall be tested by making use of them when stopping the machine.

(3) *Core collars.* The requirements of paragraph (k)(27) of this section and the American National Standard B15.1—1953 (reaffirmed 1958) shall apply.

(4) *Elevators.* These shall be accordance with American National Standard A17.1—1965.

(5) *Control panels.* The requirements of paragraph (k)(22) of this section shall apply.

(6) *Guillotine-type cutters.* (i) Each guillotine-type cutter shall be equipped with a control which requires the operator and his helper, if any, to use both hands to engage the clutch.

(ii) Each guillotine-type cutter shall be equipped with a nonrepeat device.

(iii) Carriers shall be provided and used for transportation of guillotine-type cutter knives.

(7) *Rotary cutter.* (i) On single-knife machines a guard shall be provided at a point of contact to the knife.

(ii) On duplex cutters the protection required for single-knife machines shall be provided for the first knife, and a hood shall be provided for the second knife.

(iii) Safe access shall be provided to the knives of a rotary cutter by means of catwalks with nonslip surfaces, railings, and toeboards in accordance with paragraph (b)(3) of this section.

(iv) A guard shall be provided for the spreader or squeeze roll at the nip side on sheet cutters.

(v) Electrically or manually operated quick power disconnecting devices with adequate braking action shall be provided on all operating sides of the machine within easy reach of all operators.

(vi) The outside slitters shall be guarded.

(8) *Platers.* (i) A guard shall be arranged across the face of the rolls to serve as a warning that the operator's hand is approaching the danger zone.

(ii) A quick power disconnecting device shall be installed on each machine within easy reach of the operator.

(9) *Finishing room rewinders.* (i) The nipping points of all drum winders and rewinders located on the operator's side shall be guarded by either automatic or manually operated barrier guards of sufficient height to protect fully anyone working around them. The barrier guard shall be interlocked with the drive mechanism to prevent operating above jog speed without the guard in place.

A zero speed switch should be installed to prevent the guard from being raised while the roll is turning.

(ii) A nonskid surface shall be provided in front of the rewinder to prevent an employee from slipping in accordance with paragraph (b)(3) of this section.

(iii) Mechanical lifting devices shall be provided for placing and removing rolls from the machine.

(10) *Control panels.* The requirements of paragraph (k)(22) of this section shall apply.

(11) *Roll-type embosser.* The nipping point located on the operator's side shall be guarded by either automatic or manually operated barrier guards interlocked with the drive.

(12) *Sorting and counting tables.* (i) Tables shall be smooth and free from splinters, with edges and corners rounded.

(ii) Paddles shall be smooth and free from splinters.

(13) *Roll splitters.* The nip point and cutter knife shall be guarded by either automatic or manually operated barrier guards.

(m) *Materials handling*—(1) *Hand trucks.* No person shall be permitted to ride on a powered hand truck unless it is so designed by the manufacturer. A limit switch shall be on operating handle—30 degrees each way from a 45-degree angle up and down.

(2) *Power trucks.* Power trucks shall comply with American National Standard B56.1—1969. Adequate ventilation shall be provided and the trucks properly maintained, so that dangerous concentrations of carbon monoxide cannot be generated, especially in warehouses or other isolated areas of a plant.

(3) *Cartons.* The carton-stitching machine shall be guarded to prevent the operator from coming in contact with the stitching head.

(4) *Banding of skids, cartons, cases, etc.* Banders and helpers shall wear eye protection equipment in accordance with paragraph (b)(2) of this section.

(5) *Unloading cars or trucks.* (i) Where steel bands or wires are used in boxcars or trucks, all loaders and helpers shall wear eye protection in accordance with paragraph (b)(2) of this section.

(ii) The construction and use of bridge or dock plates shall conform to the requirements of American National Standard B56.1—1969.

(iii) Flag signals, derails, or other protective devices shall be used to protect men durimg switching operations. The blue flag policy shall be invoked according to paragraph (c)(9)(i) of this section.

(n) *Effective dates.* (1) The provisions of this § 1910.261 shall become effective on August 27, 1971, except as provided in the remaining subparagraphs of this paragraph.

(2) The following provisions shall become effective on February 15, 1972:

§ 1910.261 (a)(3), (b)(6), (f)(2)(iv), (f)(5), (g)(1)(iv), (g)(11)(i), (j)(5)(iv), (k)(12), (k)(32), and (m)(2).

(3) Notwithstanding anything in subparagraph (1), (2), or (4) of this paragraph, any provision in any other paragraph of this section which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(4) Notwithstanding subparagraph (1) of this paragraph, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2(a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this § 1910.261 which is derived from 41 CFR Part 50-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.262 Textiles.

(a) *Application requirements*—(1) *Application.* The requirements of this subpart for textile safety apply to the design, installation, processes, operation, and maintenance of textile machinery, equipment, and other plant facilities in all plants engaged in the manufacture and processing of textiles, except those processes used exclusively in the manufacture of synthetic fibers.

(2) *Standards incorporated by reference.* Standards covering issues of occupational safety and health which are of general application without regard to any specific industry are incorporated by reference in paragraphs of this section and made applicable to textiles. All such standards shall be construed according to the rules of construction set out in § 1910.5.

(b) *Definitions applicable to this section*—(1) *Belt shifter.* A "belt shifter" is a device for mechanically shifting a belt from one pulley to another.

(2) *Belt shifter lock.* A "belt shifter lock" is a device for positively locking the belt shifter in position while the machine is stopped and the belt is idling on the loose pulleys.

(3) *Calender.* A "calender" in essence consists of a set of heavy rollers mounted on vertical side frames and arranged to pass cloth between them. Calenders may have two to ten rollers, or bowls, some of which can be heated.

(4) *Embossing calender.* An "embossing calender" is a calender with two or more rolls, one of which is engraved for producing figured effects of various kinds on a fabric.

(5) *Cans (drying).* Drying "cans" are hollow cylindrical drums mounted in a frame so they can rotate. They are heated with steam and are used to dry fabrics or yarn as it passes around the perimeter of the can.

(6) *Carbonizing.* "Carbonizing" means the removing of vegetable matter such as burns, straws, etc., from wool by treatment with acid, followed by heat. The undesired matter is reduced to a carbon-like form which may be removed by dusting or shaking.

(7) *Card.* A "card" machine consists of cylinders of various sizes—and in certain cases flats—covered with card clothing and set in relation to each other so that fibers in staple form may be separated into individual relationship. The speed of the cylinders and their direction of rotation varies. The finished product is delivered as a sliver. Cards of different types are: The revolving flat card, the roller-and-clearer card, etc.

(8) *Card clothing.* "Card clothing" is the material with which many of the surfaces of a card are covered; e.g., the cylinder, doffer, etc. It consists of a thick foundation material, usually made of textile fabrics, through which are pressed many fine, closely spaced, specially bent wires.

(9) *Comber.* A "comber" is a machine for combing fibers of cotton, wool, etc. The essential parts are a device for feeding forward a fringe of fibers at regular intervals and an arrangement of combs or pins which, at the right time, pass through the fringe. All tangled fibers, short fibers, and neps are removed and the long fibers are laid parallel.

(10) *Combing machinery.* "Combing machinery" is a general classification, including combers, sliver lap machines, ribbon lap machines, and gill boxes, but excluding cards.

(11) *Cutter (rotary staple).* A rotary staple "cutter" is a machine consisting of one or more rotary blades used for the purpose of cutting textile fibers into staple lengths.

(12) *Exposed to contact.* "Exposed to contact" shall mean that the location of an object, material, nip point, or point of operation is such that a person is liable to come in contact with it in his normal course of employment.

(13) *Garnett machine.* A "Garnett machine" means any of a number of types of machines for opening hard twisted waste of wool, cotton, silk, etc. Essentially, such machines consist of a lickerin; one or more cylinders, each having a complement worker and stripper rolls; and a fancy roll and doffer. The action of such machines is somewhat like that of a wool card, but it is much more severe in that the various rolls are covered with garnett wire instead of card clothing.

(14) *Gill box.* A "gill box" is a machine used in the worsted system of manufacturing yarns. Its function is to arrange the fibers in parallel order. Essentially, it consists of a pair of feed rolls and a series of followers where the followers move at a faster surface speed and perform a combing action.

(15) *Interlock.* An "interlock" is a device that operates to prevent the operation of machine while the cover or door of the machine is open or unlocked, and which will also hold the cover or door closed and locked while the machine is in motion.

(16) *Jig (dye).* A dye "jig" is a machine for dyeing piece goods. The cloth, at full width, passes from a roller through the dye liquor in an open vat and is then wound on another roller. The operation is repeated until the desired shade is obtained.

(17) *Kier.* A "kier" is a large metal vat, usually a pressure type, in which fabrics may be boiled out, bleached, etc.

(18) *Lapper (ribbon).* A ribbon "lapper" is a machine used to prepare laps for feeding a cotton comb; its purpose is to provide a uniform lap in which the fibers have been straightened as much as possible.

(19) *Lapper (Sliver).* A sliver "lapper" is a machine in which a number of parallel card slivers are drafted slightly, laid side by side in a compact sheet, and wound into a cylindrical package.

(20) *Loom.* A "loom" is a machine for effecting the interlacing of two series of yarns crossing one another at right angles. The warp yarns are wound on a warp beam and pass through heddles and reed. The filling is shot across in a shuttle and settled in place by reed and lay, and the fabric is wound on a cloth beam.

(21) *Mangle (starch).* A "starch mangle" is a mangle that is used specifically for starching cotton goods. It commonly

consists of two large rolls and a shallow open vat with several immersion rolls. The vat contains the starch solution.

(22) *Mangle (water)*. A "water mangle" is a calendar having two or more rolls used for squeezing water from fabrics before drying. Water mangles also may be used in other ways during the finishing of various fabrics.

(23) *Mule*. A "mule" is a type of spinning frame having a head stock and a carriage as its two main sections. The head stock is stationary. The carriage is movable and it carries the spindles which draft and spin the roving into the yarn. The carriage extends over the whole width of the machine and moves slowly toward and away from the head stock during the spinning operation.

(24) *Nip*. "Nip" shall mean the point of contact between two in-running rolls.

(25) *Openers and pickers*. "Openers and pickers" means a general classification which includes breaker pickers, intermediate pickers, finisher pickers, single process pickers, multiple process pickers, willow machines, card and picker waste cleaners, thread extractors, shredding machines, roving waste openers, shoddy pickers, bale breakers, feeders, vertical openers, lattice cleaners, horizontal cleaners, and any similar machinery equipped with either cylinders, screen section, calender section, rolls, or beaters used for the preparation of stock for further processing.

(26) *Paddler*. A "paddler" consists of a trough for a solution and two or more squeeze rolls between which cloth passes after being passed through a mordant or dye bath.

(27) *Point of operation*. "Point of operation" shall mean that part of the machine where the work of cutting, shearing, squeezing, drawing, or manipulating the stock in any other way is done.

(28) *Printing machine (roller type)*. A "roller printing machine" is a machine consisting of a large central cylinder, or pressure bowl, around the lower part of the perimeter of which is placed a series of engraved color rollers (each having a color trough), a furnisher roller, doctor blades, etc. The machine is used for printing fabrics.

(29) *Ranges (bleaching continuous)*. "Continuous bleaching ranges" are of several types and may be made for cloth in rope or open-width form. The goods, after wetting out, pass through a squeeze roll into a saturator containing a solution of caustic soda and then to an enclosed J-box. A V-shaped arrangement is attached to the front part of the J-box for uniform and rapid saturation of the cloth with steam before it is packed down in the J-box. The cloth, in a single strand rope form, passes over a guide roll down the first arm of the "V" and up the second. Steam is injected into the "V" at the upper end of the second arm so that the cloth is rapidly saturated with steam at this point. The J-box capacity is such that cloth will remain hot for a sufficient time to complete the scouring action. It then passes a series of washers with a squeeze roll in between. The cloth then passes through a second set of saturator, J-box, and washer, where it is treated with the peroxide solution. By slight modification of the form of the unit, the same process can be applied to open-width cloth.

(30) *Range (mercerizing)*. A "mercerizing range" consists generally of a 3-bowl mangle, a tenter frame, and a number of boxes for washing and scouring. The whole setup is in a straight line and all parts operate continuously. The combination is used to saturate the cloth with sodium hydroxide, stretch it while saturated, and washing out most of the caustic before releasing tension.

(31) *Sanforizing machine*. A "sanforizing machine" is a machine consisting of a large steam-heated cylinder, an endless, thick, woolen felt blanket which is in close contact with the cylinder for most of its perimeter, and an electrically heated shoe which presses the cloth against the blanket while the latter is in a stretched condition as it curves around feed-in roll.

(32) *Shearing machine*. A "shearing machine" is a machine used in shearing cloth. Cutting action is provided by a number of steel blades spirally mounted on a roller. The roller rotates in close contact with a fixed ledger blade. There may be from one to six such rollers on a machine.

(33) *Singeing machine*. A "singeing machine" is a machine used particularly with cotton; it comprises of a heated roller, plate, or an open gas flame. The material is rapidly passed over the roller or the plate or through the open gas flame to remove, fuzz or hairiness on yarn or cloth by burning.

(34) *Slasher*. A "slasher" is a machine used for applying a size mixture to warp yarns. Essentially, it consists of a stand for holding section beams, a size box, one or more cylindrical dryers or an enclosed hot air dryer, and a beaming end for finding the yarn on the loom beams.

(35) *Solvent (industrial organic)*. "Industrial organic solvent" means any organic volatile liquid or compound, or any combination of these substances which are used to dissolve or suspend a nonvolatile or slightly volatile substance for industrial utilization. It shall also apply to such substances when used as detergents or cleansing agents. It shall not apply to petroleum products when such products are used as fuel.

(36) *Tenter frame*. A "tenter frame" is a machine for drying cloth under tension. It essentially consists of a pair of endless traveling chains fitted with clips of fine pins and carried on tracks. The cloth is firmly held at the selvages by the two chains which diverge as they move forward so that the cloth is brought to the desired width.

(37) *Warper*. A "warper" is any machine for preparing and arranging the yarns intended for the warp of a fabric, specifically, a beam warper.

(c) *General safety requirements*—(1) *Means of stopping machines*. Every textile machine shall be provided with individual mechanical or electrical means for stopping such machines. On machines driven by belts and shafting, a locking-type shifter or an equivalent positive device shall be used. On operations where injury to the operator might result if motors were to restart after power failures, provision shall be made to prevent machines from automatically restarting upon restoration of power.

(2) *Handles*. Stopping and starting handles shall be designed to the proper length to prevent the worker's hand or fingers from striking against any revolving part, gear guard, or any other part of the machine.

(3) *Machine guarding*. Mechanical power-transmission equipment shall be guarded in conformity with § 1910.219.

(4) *Housekeeping*. Aisles and working spaces shall be kept in good order, clean and free of obstructions in accordance with requirements of § 1910.141.

(5) *Inspection and maintenance*. All guards and other safety devices, including starting and stopping devices, shall be properly maintained.

(6) *Lighting*. Lighting shall conform to American National Standard A11.1—1965.

(7) *Identification of piping systems*. Identification of piping systems shall conform to American National Standard A13.1—1956.

(8) *Identification of physical hazards*. Identification of physical hazards shall be in accordance with the requirements of § 1910.144.

(9) *Steam pipes*. All pipes carrying steam or hot water for process or servicing machinery, when exposed to contact and located within seven feet of the floor or working platform shall be covered with a heat-insulating material, or otherwise properly guarded.

(d) *Openers and pickers*—(1) *Beater guards*. When any opening or picker machinery is equipped with a beater, such beater shall be provided with metal covers which will prevent contact with the beater. Such covers shall be provided with an interlock which will prevent the cover from being raised while the machine is in motion and prevent the operation of the machine while the cover is open.

(2) *Cleanout holes*. Cleanout holes within reaching distance of the fan or picker beater shall have their covers securely fastened and they shall not be opened while the machine is in motion.

(3) *Feed rolls*. The feed rolls on all opening and picking machinery shall be covered with a guard designed to prevent the operator from reaching the nip while the machinery is in operation.

(4) *Removal of foreign ferrous material*. All textile opener lines shall be equipped with magnetic separators, tramp iron separators, or other means for the removal of foreign ferrous material.

(e) *Cotton cards*—(1) *Enclosures*. Cylinder and lickerins shall be completely protected and the doffers should be enclosed.

(2) *Enclosure fastenings*. The enclosures or covers shall be kept in place while the machine is in operation, except when stripping or grinding.

(3) *Stripping rolls*. On operations calling for flat strippings which are allowed to fall on the doffer cover, where such strippings are removed by hand, the

doffer cover shall be kept closed and securely fastened to prevent the opening of the cover while the machine is in operation. When it becomes necessary to clean the cards while they are in motion, a long-handled brush or dust mop shall be used.

(f) *Garnett machines*—(1) *Lickerin.* Garnett lickerins shall be enclosed.

(2) *Fancy rolls.* Garnett fancy rolls shall be enclosed by covers. These shall be installed in a way that keeps worker rolls reasonably accessible for removal or adjustment.

(3) *Underside of machine.* The underside of the garnett shall be guarded by a screen mesh or other form of enclosure to prevent access.

(g) *Spinning mules*—A substantial fender of metal or hardwood shall be installed in front of the carriage wheels, the fender to extend to within one-fourth inch of the rail.

(h) *Slashers*—(1) *Cylinder dryers*—(i) *Reducing valves, safety valves, and pressure gages.* Reducing valves, safety valves, and pressure gages shall conform to the ASME Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, 1968.

(ii) *Vacuum relief valves.* Vacuum relief valves shall conform to the ASME Code for Pressure Vessels, Section VIII, Unfired Pressure Vessels, 1968.

(iii) *Lever control.* When slashers are operated by control levers, these levers shall be connected to a horizontal bar or treadle located not more than 69 inches above the floor to control the operation from any point.

(iv) *Pushbutton control.* Slashers operated by pushbutton control shall have stop and start buttons located at each end of the machine, and additional buttons located on both sides of the machine, at the size box and the delivery end. If calender rolls are used, additional buttons shall be provided at both sides of the machine at points near the nips, except when slashers are equipped with an enclosed dryer.

(v) *Nip guards.* All nip guards shall comply with the requirements of subparagraph (2)(iv) of this paragraph.

(vi) *Cylinder enclosure.* When enclosures or hoods are used over cylinder drying rolls, such enclosures or hoods shall be provided with an exhaust system which will effectively prevent wet air and steam from escaping into the workroom.

(vii) *Expansion chambers.* Slasher kettles and cookers shall be provided with expansion chambers in the covers, or drains, to prevent surging over. Steam-control valves shall be so located that they can be operated without exposing the worker to moving parts, hot surfaces, or steam.

(2) *Enclosed hot air dryer*—(i) *Lever control.* When slashers are operated by control levers, these levers shall be connected to a horizontal bar or treadle located not more than 69 inches above the floor to control the operation from any point.

(ii) *Push-button control.* Slashers operated by push-button control shall have one start button at each end of the machine and stop buttons shall be located on both sides of the machines at intervals spaced not more than 6 feet on centers. Inching buttons should be installed.

(iii) *Dryer enclosure.* The dryer enclosure shall be provided with an exhaust system which will effectively prevent wet air and steam from escaping into the workroom.

(iv) *Nip guards.* All nip guards shall comply with Table R–1.

TABLE R–1

GUARD OPENINGS

Openings in the guard or between the guard and working surface shall not be greater than the following:

Distance of opening from nip point	*Maximum width of opening*
0 to 1½	¼
1½ to 2½	⅜
2½ to 3½	½
3½ to 5½	⅝
5½ to 6½	¾
6½ to 7½	⅞
7½ to 8½	1¼

The measurements in Table R–1 are all in inches.

(v) *Expansion chambers.* Slasher kettles and cookers shall be provided with expansion chambers in the covers, or drains, to prevent surging over. Steam control valves shall be so located that they can be operated without exposing the worker to moving parts, hot surfaces, or steam.

(i) *Warpers*—(1) *Swiveled double-bar gates.* Swiveled double-bar gates shall be installed on all warpers operating in excess of 450 yards per minute. These gates shall be so interlocked that the machine cannot be operated until the gate is in the "closed position," except for the purpose of inching or jogging.

(2) *Closed position.* "Closed position" shall mean that the top bar of the gate shall be at least 42 inches from the floor or working platform; and the lower bar shall be at least 21 inches from the floor or working platform; and the gate shall be located 15 inches from the vertical tangent to the beam head.

(j) *Drawing frames, slubbers, roving parts, cotton combers, ring spinning frames, twisters.* Gear housing covers on all installations of drawing frames, slubbers, roving frames, cotton combers, ring spinning frames, and twisters shall be equipped with interlocks.

(k) *Gill boxes*—(1) *Pin guard.* A guard shall be placed ahead of the feed end and shall be so designed that it will prevent the worker's fingers from being caught in the pins of the intersecting fallers.

(2) *Nip guards.* All nip guards shall comply with the requirements of paragraph (h)(2)(iv) of this section.

(l) *Heavy draw boxes, finishers, and speeders used in worsted drawing*—(1) *Band pulley covers.* Covers for band pulleys shall be closed when the machine is in motion.

(2) *Benches or working platforms.* Branches or working platforms approximately 10 inches in height and 8 inches in width should be installed along the entire running length of the machine for the worker to stand on while creeling the machine. Such benches or platforms shall be covered with an abrasive or nonslip material.

(m) *Silver and ribbon lappers (cotton).* Cover guard. An interlocking cover guard shall be installed over the large calendar drums and the lap spool, designed to prevent the operator from coming in contact with the nip.

(n) *Looms*—(1) *Shuttle guard.* Each loom shall be equipped with a guard designed to minimize the danger of the shuttle flying out of the shed.

(2) *Protection for loom fixer.* Provisions shall be made so that every loom fixer can prevent the loom from being started while he is at work on the loom. This may be accomplished by means of a lock, the key to which is retained in the possession of the loom fixer, or by some other effective means to prevent starting the loom.

(o) *Shearing machines.* All revolving blades on shearing machines shall be guarded so that the opening between the cloth surface and the bottom of the guard will not exceed three-eighths inch.

(p) *Continuous bleach range (cotton and rayon)*—(1) *J-box protection.* Each valve controlling the flow of steam, injurious gases, or liquids into a J-box shall be equipped with a chain, lock, and key, so that any worker who enters the J-box can lock the valve and retain the key in his possession. Any other method which will prevent steam, injurious gases, or liquids from entering the J-box while the worker is in it will be acceptable.

(2) *Open-width bleaching.* The nip of all in-running rolls on open-width bleaching machine rolls shall be protected with a guard to prevent the worker from being caught at the nip. The guard shall extend across the entire length of the nip.

(q) *Kiers*—(1) *Reducing valves, safety valves, and pressure gages.* Reducing valves, safety valves, and pressure gages shall conform to the ASME Code for Unfired Pressure Vessels, Section VIII, Unfired/Pressure Vessels, 1968.

(2) *Kier valve protection.* Each valve controlling the flow of steam, injurious gases, or liquids into a kier shall be equipped with a chain, lock, and key, so that any worker who enters the kier can lock the valve and retain the key in his possession. Any other method which will prevent steam, injurious gases, or liquids from entering the kier while the worker is in it will be acceptable.

(r) *Gray and white bins.* On new installations guard rails conforming to § 1910.23 shall be provided where workers are required to plait by hand from the top of the bin so as to protect the worker from falling to a lower level.

(s) *Mercerizing range (piece goods)*—(1) *Stopping devices.* A stopping device shall be provided at each end of the machine.

(2) *Frame ends.* A guard shall be installed at each end of the frame between the in-running chain and the clip opener, to prevent the worker's fingers from being caught.

(3) *Mangle and washers*. The nip at the in-running rolls shall conform to § 1910.264.

(t) *Tenter frames*—(1) *Stopping devices*. A stopping device shall be provided at each end of the machine.

(2) *Frame ends*. A guard shall be installed at each end of the frame at the in-running chain and clip opener.

(3) *Oil cups*. Oil cups shall be safely located to permit easy access.

(u) *Dyeing jigs*—(1) *Stopping devices*. Each dye jig shall be equipped with individual mechanical or electrical means for stopping the machine.

(2) *Roll arms*. Roll arms on jigs shall be built to allow for extra large batches, and to prevent the center bar from being forced off, causing the batch to fall.

(v) *Padders*—*Nip guards*. All nip guards shall comply with the requirements of paragraph (h)(2)(iv) of this section.

(w) *Drying cans*—(1) *Pressure reducing valves and pressure gages*. Pressure reducing valves and pressure gages shall conform to the ASME Code for Pressure Vessels, Section VIII, 1968, Unfired Pressure Vessels.

(2) *Vacuum collapse*. If cans are not designed to prevent vacuum collapse, each can shall be equipped with one or more vacuum relief valves with openings of sufficient size to prevent the collapse of the can if vacuum occurs.

(x) *Flat-work ironer*—(1) *Feed rolls*. The feed rolls shall be guarded to conform to § 1910.264.

(2) *Pressure rolls*. Pressure rolls shall be covered or guarded to conform to § 1910.264.

(y) *Extractors*—(1) *Centrifugal extractor*—(i) *Cover*. Each extractor shall be equipped with a metal cover.

(ii) *Interlocking device*. Each extractor shall be equipped with an interlocking device that will prevent the cover from being opened while the basket is in motion, and also prevent the power operation of the basket while the cover is open.

(iii) *Brakes*. Each extractor shall be equipped with a mechanically or electrically operated brake to quickly stop the basket when the power driving the basket is shut off.

(iv) *Maximum allowable speed*. Each centrifugal extractor shall be effectively secured in position on the floor or foundation so as to eliminate unnecessary vibration, and should not be operated at a speed greater than the manufacturer's rating, which shall be stamped where easily visible in letters not less than one-quarter inch in height. The maximum allowable speed shall be given in revolutions per minute (rpm).

(2) *Engine drum extractor*—*Overspeed governor*. Each engine individually driving an extractor shall be provided with an approved engine stop and speed limit governor.

(3) *Squeezer or wringer extractor*—*Nip guards*. All nip guards shall comply with the requirements of paragraph (h)(2)(iv) of this section.

(z) *Nip guards*. All nip guards for water mangle, starch mangle, backwasher (worsted yarn) crabbing machines, decating machines, shall comply with the requirements of paragraph (h)(2)(iv).

(aa) *Sanforizing and palmer machine*. A safety trip rod, cable, or wire center cord shall be provided across the front and back of all palmer cylinders extending the length of the face of the cylinder. It shall operate readily whether pushed or pulled. This safety trip shall be not more than 72 inches above the level on which the operator stands and shall be readily accessible.

(bb) *Rope washers*—(1) *Splash guard*. Splash guards shall be installed on all rope washers unless the machine is so designed as to prevent the water or liquid from splashing the operator, the floor, or working surface.

(2) *Safety stop bar*. A safety trip rod, cable or wire center cord shall be provided across the front and back of all rope washers extending the length of the face of the washer. It shall operate readily whether pushed or pulled. This safety trip shall be not more than 72 inches above the level on which the operator stands and shall be readily accessible.

(cc) *Laundry washer tumbler or shaker*—(1) *Interlocking device*. Each drying tumbler, each double cylinder shaker or clothes tumbler, and each washing machine shall be equipped with an interlock device which will prevent the power operation of the inside cylinder when the outer door on the case or shell is open, and which will also prevent the outer door on the case or shell from being opened without shutting off the power. This should not prevent the movement of the inner cylinder by means of a hand operated mechanism or an "inching device."

(2) *Means of holding covers or doors in open position*. Each enclosed barrel shall also be equipped with adequate means for holding open the doors or covers of the inner and outer cylinders or shells while it is being loaded or unloaded.

(dd) *Printing machine (roller type)*—(1) *Nip Guards*. All nip guards shall comply with the requirements of paragraph (h)(2)(iv) of this section.

(2) *Crown wheel and roller gear nip protection*. The engraved roller gears and the large crown wheel shall be provided with a protective disc which will enclose the nips of the in-running gears. Individual discs for each nip will be acceptable.

(ee) *Calenders*. The nip at the in-running side of the rolls shall be provided with a guard extending across the entire length of the nip and arranged to prevent the fingers of the workers from being pulled in between the rolls or between the guard and the rolls, and constructed so that the cloth can be fed into the rolls safely.

(ff) *Rotary staple cutters*. A guard shall be installed completely enclosing the cutters to prevent the hands of the operator from reaching the cutting zone.

(gg) *Clothing folding machine*. The crank arm and blade guide rods on both sides of the cloth-folding machines shall be protected from contact by barrier guards constructed to conform to the requirements of § 1910.219.

(hh) *Hand bailing machine*. An angle-iron-handle stop guard shall be installed at the right angle to the frame of the machine. The stop guard shall be so designed and so located that it will prevent the handle from traveling beyond the vertical position should the handle slip from the operator's hand when the pawl has been released from the teeth of the takeup gear.

(ii) *Roll bench*. Cleats shall be installed on the ends of roll benches.

(jj) *Cuttle or swing folder (overhead type)*. The bottom of the overhead folders shall be located not less than 7 feet from the floor or working surface.

(kk) *Color-mixing room*. Floors in color-mixing rooms shall be constructed to drain easily.

(ll) *Open tanks and vats for mixing and storage of hot or corrosive liquids*—(1) *Protection against falls*. Open tanks and vats containing hot or corrosive liquids shall be protected to conform to the requirements of § 1910.23.

(2) *Shutoff valves*. Boiling tanks, caustic tanks, and hot liquid containers, so located that the operator cannot see the contents from the floor or working area, shall have emergency shutoff valves controlled from a point not subject to danger of splash. Valves shall conform to the ASME Pressure Vessel Code, section VIII, Unfired Pressure Vessels, 1968.

(mm) *Dye kettles and vats*.—Pipes or drains of sufficient capacity to carry the contents safely away from the working area shall be installed where there are dye kettles and vats which may at any time contain hot or corrosive liquids. These shall not empty directly onto the floor.

(nn) *Acid carboys*. Carboys shall be provided with inclinators, or the acid shall be withdrawn from the carboys by means of pumping without pressure in the carboy, or by means of hand operated siphons.

(oo) *Handling caustic soda and caustic potash*. Means shall be provided for handling and emptying caustic soda and caustic potash containers to prevent workers from coming in contact with the caustic (see paragraph (qq) of this section).

(pp) *First aid*. Wherever acids or caustics are used, provision shall be made for a copious and flowing supply of fresh, clean water.

(qq) *Personal protective equipment*—(1) *Personal protective equipment*. Workers engaged in handling acids or caustics in bulk, repairing pipe lines containing acids or caustics, etc., shall be provided with protective occupational (safety) equipment to conform to the requirements of § 1910.132, § 1910.133, and § 1910.134.

(2) Respirators, gas masks, and such appliances, for emergency use only, shall be of a type required by § 1910.134.

(rr) *Workroom ventilation*. In all workrooms in which potentially toxic substances are used, the maximum allowable concentrations listed in § 1910.93

shall be maintained. Open surface tanks shall conform to the requirements of § 1910.94(d).

§ 1910.263 Bakery equipment.

(a) *General requirements*—(1) *Application.* The requirements of this section shall apply to the design, installation, operation and maintenance of machinery and equipment used within a bakery.

(2) *Standards incorporated by reference.* Standards covering issues of occupational safety and health which are of general application without regard to any specific industry are incorporated by reference in paragraphs of this section and made applicable to bakeries. All such standards shall be construed according to the rules of construction set out in § 1910.5.

(b) *Definitions applicable to this section*—(1) *Dumpbin and blender.* The term "dumpbin and blender" applies to those elements of a flour handling system in which flour in bags is first emptied for distribution.

(2) *Flour elevator.* The term "flour elevator" means the conveyor which is used to convey flour in a vertical direction and it includes bucket, spiral screw, or bulkflow conveyors.

(3) *Screw conveyor.* The term "screw conveyor" means the conveyor which is used to convey flour in a horizontal or inclined plane by means of a continuous spiral screw enclosed in a suitable casing which follows the same general contour of the perimeter of the screw.

(4) *Bolting reel.* The term "bolting reel" means a device in which the flour is screened through a rotating drum.

(5) *Sifter.* The term "sifter" means a device in which flour is sifted. It may be of the brush, oscillating, or vibrating type.

(6) *Flour scale.* The term "flour scale" means a scale for weighing flour.

(7) *Flour gate.* The term "flour gate" means the device or devices used to control the delivery of flour.

(8) *Direct fired ovens.* Direct fired ovens are ovens which burn fuel directly inside the baking chamber.

(9) *Direct recirculating ovens.* "Direct recirculating ovens" are ovens which have heating systems consisting of one or more heaters (located inside or outside the baking chamber), each heater being equipped with a burner, the products of combustion of which are mixed with spent gasses returned from the oven. Combustion gases are circulated through the heater and oven chamber by a fan. An overflow or vent removes part of the spent combustion gases to compensate for fresh combustion gases added by the burner.

(10) *Flue-type ovens.* "Flue-type ovens" are ovens which burn fuel in a furnace which is connected through flues which carry the combustion gases to a stack.

(11) *Indirect multiple-burner ovens.* "Indirect multiple-burner ovens" are ovens which are heated by burners (usually gas) which are totally enclosed in such a way that unburned gases or products of combustion cannot enter the baking chamber.

(12) *Steam-tube ovens.* "Steam-tube ovens" are ovens which are heated by a group of tubes which are partially filled with liquid and sealed at both ends. A small part of each tube is exposed to the heat of a furnace and the larger part placed inside the baking chamber. Heat is transmitted by evaporating liquid in the furnace end of the tube. Steam thus formed travels to the other end of the tube, where the steam condenses and returns to the furnace by gravity.

(13) *Indirect recirculating ovens.* "Indirect recirculating ovens" are ovens which are equipped with a gas tight duct system, a furnace, and a circulating fan. Gases of combustion are circulated through this enclosed system and mixed with fresh combustion gases generated by the burner in the combustion chamber. A vent or overflow removes a portion of the gases to compensate for the fresh gases added by the burner. No unburned gases or products of combustion have access to the baking chamber.

(14) *Electric ovens.* "Electric ovens" are ovens which are heated entirely by passing an electric current through resistance elements.

(c) *General machine guarding*—(1) *Electrical grounding.* The frame of each machine which is driven by an electric motor or has any electrical connection shall be effectively grounded.

(2) *Gears.* All gears shall be completely enclosed regardless of location.

(3) *Sprockets and V-belt drives.* Sprockets and V-belt drives located within reach from platforms or passageways or located within 8 feet 6 inches from the floor shall be completely enclosed.

(4) *Rotating parts.* Lubrication fittings on rotating parts shall be recessed or covered with collars so that the rotating surface will be smooth and flush.

(5) *Lubrication.* Where machinery must be lubricated while in motion, stationary lubrication fittings inside a machine shall be provided with extension piping to a point of safety so that the employee will not have to reach into any dangerous part of the machine when lubricating.

(6) *Removable covers or guards.* Any covers or guards which must be removed for cleaning and adjustment shall be made easily removable in order that they may be removed and replaced with the least effort.

(7) *Ventilation through machine guards.* Where it is necessary to guard motors or other equipment which require ventilation, guards should be so designed that they will not restrict the circulation of the air.

(8) *Hot pipes.* Exposed hot water and steam pipes shall be covered with insulating material wherever necessary to protect employee from contact.

(d) *Flour-handling equipment.*—(1) *General requirements for flour handling.* (i) Wherever any of the various pieces of apparatus comprising a flour-handling system are run in electrical unity with one another the following safeguards shall apply:

(*a*) Each apparatus shall be properly safeguarded by of disconnecting means for the motor circuits as required by §§ 1910.312 and 1910.320.

(*b*) Wherever a flour-handling system is of such size that the beginning of its operation is far remote from its final delivery end, all electric motors operating each apparatus comprising this system shall be controlled at each of two points, one located at each remote end, either of which will stop all motors.

(*c*) Motor control switches shall be capable of being locked in the open position.

(*d*) Control circuits for magnetic controllers shall be so arranged that the opening of any one of several limit switches, which may be on an individual unit, will serve to de-energize all of the motors of that unit.

(ii) Removable covers on all flour-handling equipment shall be so designed that the lifting effort shall not be more than 50 pounds.

(iii) Wherever flour-handling systems are of large construction, suitable walkways or platforms or both shall be constructed around and over bins and apparatus, in accordance with the requirements of §§ 1910.22 and 1910.23.

(*a*) All walkway surfaces shall be maintained in nonslip condition.

(*b*) Elevated walkways shall have railings and toeboards.

(*c*) All ladders leading to upper walkways shall be in accordance with the requirements of § 1910.25, § 1910.26, and § 1910.27.

(*d*) Wherever walkways are near the ceiling construction of the building, where obstruction to head room is lower than normal standing height, proper methods shall be provided to warn any occupant of the walkway. This should be done by means of "tell tales" or other suitable means located ahead of the obstruction. Suitable signs shall also be placed on walkways warning occupants of possible danger.

(iv) All oscillating and vibrating sifters shall be protected with guard rails of suitable height and design.

(v) All mechanical transmission shafting, gearing, and sprocket drives shall be completely guarded, preferably with dust-tight housing. Lubrication fittings shall extend to the outside of the guard.

(vi) All guards shall be readily removable.

(vii) All flour-handling equipment, each individual unit or the entire system collectively, shall be so constructed that all interior or exterior protruding corners are of a rounded nature.

(viii) When Class II hazardous conditions prevail, electric motors, motor controllers, and switches shall be of the type approved for such locations in accordance with the requirements of § 1910.326.

(2) *Bag chutes and bag lifts* (*bag-arm elevators*). (i) Bag chutes (gravity chutes for handling flour bags) shall be so designed so as to keep to a minimum the speed of flour bags. If the chute inclines more than 30° from the horizontal,

there shall be an upturn at the lower end of the chute to slow down the bags.

(ii) Bag-arm elevators with manual takeoff shall be designed to operate at a capacity not exceeding seven bags per minute. The arms on the conveyor chain shall be so spaced as to obtain the full capacity of the elevator with the lowest possible chain speed. There shall be an electric limit switch at the unloading end of the bag-arm elevator so installed as to automatically stop the conveyor chain if any bag fails to clear the conveyor arms.

(iii) The conveyor chain on bag-arm elevators shall travel in a suitable structure and all drums shall be completely guarded, so that in case of a broken chain link the remainder of the chain will remain within its guides.

(iv) Man lifts shall be prohibited in bakeries. Bag or barrel lifts shall not be used as man lifts.

(3) *Dumpbin and Blender.* (i) The dumpbin or blender shall be constructed of metal or other nonsplintering material.

(ii) Openings shall be protected by means of bars or grids. If grids are made of mesh, the openings shall be not more than 3 inches in either length or width. If parallel bars or rods are used, they shall be spaced not more than 3 inches apart on centers.

(iii) Hinged dumpbin covers shall be provided with locks or latches to hold the covers in the open position, so that they will not accidentally fall down while the dumpbin is in operation.

(iv) Dumpbins and blenders shall be so constructed that no separate pits in floors shall be required at the point which connects the final discharge to the usual elevator.

(v) All dumpbin and blender hoods shall be of sufficient capacity to prevent circulation of flour dust outside the hoods.

(vi) All dumpbins shall be of a suitable height from floor to enable the operator to dump flour from bags, without causing undue strain or fatigue. Where the edge of any bin is more than 24 inches above the floor, a bag rest step shall be provided.

(vii) A control device for stopping the dumpbin and blender shall be provided close to the normal location of the operator.

(viii) A screen shall be provided in the suction nozzle over the bin or blender to prevent sacks that are being cleaned from getting into the rotor of the dust collecting fan.

(4) *Flour elevators.* (i) Flour elevators shall be constructed of metal or other nonsplintering material.

(ii) All removable sections of the elevator casing shall be equipped with suitable stationary clamps for quick removal, or shall be equipped with equivalent locking devices which contain no loose parts which may become detached from either the casing or the cover.

(5) *Bolting reels.* (i) Bolting reels shall be constructed of metal or other nonsplintering material, with the exception of the bolting cloth.

(ii) Refuse tailing spouts shall be readily accessible and shall be located at a safe distance from unguarded moving parts.

(6) *Storage bins.* (i) Storage bins shall be constructed of metal or other nonsplintering material.

(ii) Storage bins shall be provided with gaskets and locks or latches to keep the cover closed, or other equivalent devices in order to insure the dust tightness of the cover. Covers at openings where an employee may enter the bin shall also be provided with a hasp and a lock, so located that the employee may lock the cover in the open position whenever it is necessary to enter the bin.

(iii) Storage bins where the side is more than 5 feet in depth shall be provided with standard stationary safety ladders, both inside and outside, to reach from floor level to top of bin and from top of bin to inside bottom, keeping the ladder end away from the moving screw conveyor.

(iv) Loading distribution conveyors shall be located in top of bin centrally unhoused, and all covers for entrance to the bins shall be located away from the loading distribution conveyor.

(v) An electric limit switch or other suitable protective device shall be provided in the top of the bin centrally over the loading screw conveyor on the opposite end of the flour entrance opening. It shall be so designed as to stop the loading screw if an excessive amount of flour is delivered to the bin.

(vi) The main entrance cover of large storage bins located at the interior exit ladder shall be provided with an electric interlock for motors operating both feed and unloading screw, so that these motors cannot operate while the cover is open.

(7) *Screw conveyors.* (i) Screw conveyors shall be constructed of metal or other nonsplintering material.

(ii) Each dead-end screw conveyer shall be provided with an overflow safety gate which will operate an electric limit switch to shut down the conveyer before dangerous pressure of material is built up at the dead end.

(iii) The covers of all screw conveyors shall be made removable in convenient sections, held on with stationary clamps located at proper intervals keeping all covers dust-tight. Where drop or hinged bottom sections are provided this provision shall not apply.

(8) *Sifters.* (i) Enclosures of all types of flour sifters shall be so constructed that they are dust-tight but readily accessible for interior inspection.

(ii) Oscillating and vibrating sifters shall be so constructed that all moving parts are well within the outer frame of the apparatus.

(iii) Refuse tailing spouts of all types of sifters shall be readily accessible and shall be located at a safe distance from unguarded moving parts.

(9) *Flour scales.* (i) Flour scales shall be constructed of metal or other nonsplintering material.

(ii) Where a transparent covering is provided over dial scales it shall be made of a nonshatterable transparent material.

(iii) Traveling or track-type flour scales shall be equipped with bar handles for moving same. The bar should be at least 1 inch in diameter and well away from trolley track wheels.

(iv) All moving trolley wheels located within 8 feet 6 inches of floors or platforms shall be fully guarded on sides and ahead of rotating motion.

(v) The scale cutoff switch shall be totally enclosed and connected to the scale beam in such a manner as to protect the operator from contact.

(vi) Where two or more scales are used on travelling flour scales, interlocks shall be provided so that the gate will not open unless the hopper is below.

(10) *Automatic flour gates.* Automatic flour-gate equipment shall be constructed of metal or other nonsplintering material.

(e) *Mixers*—(1) *Horizontal dough mixers.* (i) Mixers with external power application shall have all belts, chains, gears, pulleys, sprockets, clutches, and other moving parts completely enclosed.

(ii) Mixers with built-in power units shall have all drive elements enclosed in such a manner as to prevent injury to operators or maintenance personnel performing their normal duties.

(iii) Each mixer shall be equipped with an individual motor and control, and with a conveniently located manual switch to prevent the mixer from being started in the usual manner while the machine is being serviced and cleaned.

(iv) All electrical control stations shall be so located that the operator must be in full view of the bowl in its open position. No duplication of such controls other than a stop switch shall be permitted.

(v) All mixers with power and manual dumping arrangements shall be equipped with safety devices which shall:

(*a*) Engage both hands of the operator, when the agitator is in motion under power, and while the bowl is opened more than one-fifth of its total opening.

(*b*) Prevent the agitator from being started, while the bowl is more than one-fifth open, without engaging both hands of the operator;

(*c*) Permit the operator to have a full view of the bowl opening while he is in the act of maintaining operation of the agitator at any time while the bowl is more than one-fifth open.

(vi) Mixers with power dumping devices shall be arranged so that the bowl opening cannot be closed beyond four-fifths of its total opening unless the operator maintains the control contact which causes the dump motor to complete the bowl closure. Alternatively the control may be so arranged that the operator must keep at least one hand engaged, by holding in a push button, during the entire closure of the mixing bowl.

(vii) Mixers shall be provided with flour-gate operating mechanisms, ingredient openings, and water inlets, which can be conveniently manipulated by the operator from the normal area of activity (either platform or floor) without requiring abnormal reaching, or improvisations which might jeopardize his safety.

(viii) Every mixer shall be equipped with a full enclosure over the bowl which is closed at all times while the agitator is in motion. Only minor openings in this enclosure, such as ingredient doors, flour inlets, etc., each representing less than 1½ square feet in area, shall be capable of being opened while the mixer is in operation.

(ix) No loose access doors and covers weighing more than 2 pounds shall be used on mixers. Such parts shall be hinged or otherwise held in proximity to the openings that they cover.

(x) Overhead covers or doors which are subject to accidental closure shall be counterbalanced to remain in an open position or provided with means to hold them open until positively released by the operator.

(xi) Provision shall be made to bolt mixers solidly to the floor to prevent dislocation or excessive vibration, and no open space between mixers and platforms shall be permitted which may endanger the operator.

(xii) Mixers shall be installed only on substantial foundations which are capable of safely withstanding the live loads incurred in full-capacity mixing operations.

(xiii) Access for lubrication at all points shall be provided so as to avoid contact between the lubricating device or the operator's hands and any moving parts.

(xiv) Any device or mechanism used to return "sponges" to a mixer shall be so interlocked with the mixer as to prevent injury to the operator.

(xv) No electrical pilot or control circuits shall be employed at a potential in excess of 240 volts.

(xvi) A motor-running overcurrent protective device shall be provided for each motor. Undervoltage protection shall be provided in all magnetic controllers.

(xvii) Positive means shall be provided to prevent application of pressure above the stipulated maximum in all mixer cooling jackets.

(xviii) Valves and controls to regulate the coolant in mixer jackets shall be located so as to permit access by the operator without jeopardizing his safety.

(2) *Vertical Mixers.* (i) Vertical mixers shall comply with subdivisions (i), (ii), (iii), (ix) through (xiii), (xv), (xvi), and (xvii) of subparagraph (1) of this paragraph.

(ii) Positive means shall be provided to prevent injury to the operator during speed-change manipulation.

(iii) Bowl locking devices shall be of a positive type which require the attention of the operator for unlocking.

(iv) Devices shall be made available for moving bowls weighing more than 80 pounds, with contents, into and out of the mixing position on the machine.

(v) Every precaution which does not impair the normal operation of the mixer shall be exercised in providing protection of the operator against injury by the moving agitators.

(f) *Dividers*—(1) *Pinch and shear points.* All pinch points and shear points from reciprocating or rotating parts of the divider shall be enclosed or guarded, to protect the operator's hands and fingers from these hazards.

(2) *Front guards.* Guards at front of a divider shall be so arranged that the weight of dough can be adjusted without removing the guard.

(3) *Rear of divider.* The back of the divider shall have a complete cover to enclose all of the moving parts, or each individual part shall be enclosed or guarded to remove the separate hazards. The rear cover shall be provided with a limit switch in order that the machine cannot operate when this cover is open. The guard on the back shall be hinged so that it cannot be completely removed and if a catch or brace is provided for holding the cover open, it shall be designed so that it will not release due to vibrations or minor bumping whereby the cover may drop on an employee.

(4) *Oil holes in knife.* The oil holes in the knife at the back of the divider shall be of such size that an employee's finger cannot go through the hole.

(5) *Knife actuating arm.* There shall be a saddle guard or other protective device on any elongated hole in the knife actuating arm at the back of the divider.

(6) *Shear pins.* Dividers shall be equipped with mechanical overload release devices such as sheer pins.

(g) *Moulders*—(1) *Hoppers.* Mechanical feed moulders shall be provided with hoppers so designed and connected to the proofer that an employee's hands cannot get into the hopper where they will come in contact with the in-running rolls.

(2) *Hand-fed moulders.* Hand-fed moulders shall be provided with a belt-feed device or the hopper shall be extended high enough so that the hands of the operator cannot get into the feed rolls. The top edge of such a hopper shall be well rounded to prevent injury when it is struck or bumped by the employee's hand.

(3) *Stopping devices.* There shall be a stopping device within easy reach of the operator who feeds the moulder and another stopping device within the reach of the employee taking the dough away from the moulder.

(4) *Cleanout holes.* Machines shall be so designed that there is no shear point in close proximity to the cleanout holes.

(5) *Rear of moulders.* At the rear of moulders all revolving shafts shall have round corners or cylindrical surfaces, and all bolts shall be flush. Tie rods shall be far enough from revolving parts to prevent a shearing or pinching hazard.

(6) *Adjustment crank.* Where a removable crank is used to adjust the moulder for different sizes of loaf, brackets shall be provided on the side of the machine for holding the crank when it is not in use.

(h) *Manually fed dough brakes*—(1) *Top-roll protection.* The top roll shall be protected by a heavy gage metal shield extending over the roll to go within 6 inches of the hopper bottom board. The shield may be perforated to permit observation of the dough entering the rolls.

(2) *Emergency stop bar.* An emergency stop bar shall be provided, so located that the body will press against it if the operator slips and falls toward the rolls, or if the operator gets his hand caught in the rolls, and this pressure shall positively open a circuit which will deenergize the drive motor. In addition a magnetic, spring-set brake shall be deenergized at the same time, causing the rolls to stop instantly. The emergency stop bar shall be checked every 30 days.

(i) *Miscellaneous equipment*—(1) *Proof boxes.* All door locks shall be operable both from within and outside the box. Guide rails shall be installed to center the rack as it enters, passes through, and leaves the proof box.

(2) *Fermentation room.* Fermentation room doors shall have nonshatterable wire glass or plastic panels for vision through doors.

(3) *Troughs.* Troughs shall be mounted on antifriction bearing casters thus making it possible for the operator to move and direct the motion of the trough with a minimum of effort.

(4) *Hand trucks.* (i) Casters shall be set back from corners to be out of the way of toes and heels, but not far enough back to cause the truck to be unstable.

(ii) A lock or other device shall be provided to hold the handle in vertical position when the truck is not in use.

(5) *Lift trucks.* A lock or other device shall be provided to hold the handle in vertical position when the truck is not in use.

(6) *Racks.* (i) Sharp splintered or rough corners and edges shall be eliminated.

(ii) Racks shall be equipped with handles so located with reference to the frame of the rack that no part of the operator's hands extends beyond the outer edge of the frame when holding onto the handles.

(iii) Antifriction bearing casters shall be used to give the operator better control of the rack.

(iv) End guards shall be used at shelf levels on proofing racks.

(7) *Conveyors.* (i) Wherever a conveyor passes over a main aisleway, regularly occupied work area, or passageway, the underside of the conveyor shall be completely enclosed to prevent broken chains or other material from falling in the passageway.

(ii) Stop bumpers shall be installed on all delivery ends of conveyors, wherever manual removal of the product carried is practiced.

(iii) Where hazard of getting caught exists a sufficient number of stop buttons shall be provided to enable quick stopping of the conveyor.

(8) *Overhead rail systems.* (i) Handles for operating devices for trolley switches which hang less than 6 feet 8 inches from the floor shall be of pliable material.

(ii) Floor scales. Nonshatterable transparent material shall be used to cover dials.

(9) *Dough chutes.* The entrance to the chute shall be guarded so as to protect the employee from falling into chute, stepping into chute, or tripping over too low an edge of the chute.

(10) *Skids.* (i) All sharp corners or edges shall be eliminated on all metal skids.

(ii) All edges and corners shall be protected on skids to prevent exposed splinters.

(11) *Ingredient premixers, emulsifiers, etc.* (i) All top openings shall be provided with covers attached to the machines. These covers should be so arranged and interlocked that power will be shutoff whenever the cover is opened to a point where the operator's fingers might come in contact with the beaters.

(ii) Portable electrical agitators for ingredient premixers shall have the attachment cord so wired that the agitator will be grounded whenever it is connected to a source of power.

(12) *Chain tackle.* (i) All chain tackle shall be marked prominently, permanently, and legibly with maximum load capacity.

(ii) All chain tackle shall be marked permanently, and legibly with minimum support specification.

(iii) Safety hooks shall be used.

(13) *Trough hoists, etc.* (i) All hoists shall be marked prominently, permanently, and legibly with maximum load capacity.

(ii) All hoists shall be marked permanently and legibly with minimum support specifications.

(iii) Safety catches shall be provided for the chain so that the chain will hold the load in any position.

(iv) Safety hooks shall be used.

(14) *Air-conditioning units.* (i) All sharp corners and edges shall be eliminated.

(ii) On large units with doors to chambers large enough to be entered, all door locks shall be operable from both inside and outside.

(15) *Pan washing tanks.* (i) Counterbalanced hinged covers, or sliding covers, shall be provided.

(ii) The surface of the floor of the working platform shall be maintained in nonslip condition.

(iii) Working platforms shall be kept at least 32 inches below the top of the tank or guardrail.

(iv) All electrical sockets in pan washing rooms shall be nonmetallic and keyless and other electrical equipment shall be moisture proof.

(v) Power ventilated exhaust hoods shall be provided over the tanks.

(16) *Pan washing machines.* Sharp corners and edges shall be eliminated.

(17) *Cake depositors.* All pinch points shall be eliminated, guarded, or shielded so that hands and arms cannot reach these pinch points while the machine is in operation.

(18) *Icing machines.* All pinch points shall be eliminated, or provided with guards or shields so hands and arms cannot reach these pinch points while the machine is in operation.

(19) *Bread coolers, conveyor type.* (i) All pinch points shall be eliminated or guarded.

(ii) Stop bumpers on all delivery ends of conveyors shall be installed wherever manual removal of the product carried is practiced.

(20) *Bread coolers, rack type.* (i) Guardrails shall be installed to the center rack as it enters and leaves the cooler.

(ii) All door locks shall be operable from both within and outside the cooler.

(21) *Bread and cake boxes, trays, etc.* (i) Sharp corners and edges shall be eliminated on metal parts.

(iii) All wooden corners and edges shall be protected to prevent splinters.

(22) *Doughnut machines.* Separate flues shall be provided, (i) for venting vapors from the frying section, and (ii) for venting products of combustion from the combustion chamber used to heat the fat.

(23) *Open fat kettles.* (i) The floor around kettles shall be maintained in nonslip condition.

(ii) Fire extinguishing devices suitable for Class–B fires shall be provided. See § 1910.157.

(iii) Goggles or face shields shall be provided to prevent injuries from hot fat splashes.

(iv) The top of the kettle shall be not less than 36 inches above floor or working level.

(24) *Steam kettles.* (i) Positive locking devices shall be provided to hold kettles in the desired position.

(ii) Kettles with steam jackets shall be provided with safety valves in accordance with the ASME Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, 1968.

(j) *Slicers and wrappers*—(1) *Slicers.* (i) Sprockets, chains, and V-belt drives on slicers shall be completely enclosed.

(ii) All slicing machines shall be provided with a mechanical device to push the last loaf through the slicer knives.

(iii) The cover over the knife head of reciprocating-blade slicers shall be provided with an interlocking arrangement so that the machine cannot operate unless the cover is in place.

(iv) On slicers with endless band knives, each motor shall be equipped with a magnet brake which operates whenever the motor is not energized. Each door, panel, or other point of access to the cutting blades shall be arranged by means of mechanical or electric interlocks so that the motor will be deenergized if all such access doors, panels, or access points are not closed.

(v) When it is necessary to sharpen slicer blades on the machine, a barrier shall be provided leaving only sufficient opening for the sharpening stone to reach the knife blades.

(vi) Where pusher fingers attached to the feed chain enter the bed plate of the cross feed, the end guard shall be extended to cover the pinch point.

(vii) *Slicer wrapper conditions:* (*a*) Where the flight chain on the slicer turns under the bed plate on the crossfeed to the wrapper, a spring-hinged section of bed plate shall be provided so that there is no shear point between the flight chain and the bed plate.

(*b*) Wrapping and slicing machines obtained from separate manufacturers, shall be installed and connected so that the chains, sprockets, belts, and moving parts are properly guarded. Safe interconnections for the starting and stopping of such devices shall be employed.

(*c*) Mechanical control levers for starting and stopping both slicing machine conveyors and wrapping machines shall be extended or so located that an operator in one location can control both machines. Such levers should be provided wherever necessary, but these should be so arranged that there is only one station capable of starting the wrapping machine and conveyor assembly, and this starting station should be so arranged or guarded as to prevent accidental starting. The electric control station for starting and stopping the electric motor driving the wrapping machine and conveyor should be located near the clutch starting lever.

(*d*) The transfer chain shall be completely covered on all sides, not just on front and top.

(2) *Wrappers.* (i) Any hand wheel which may be provided in order to turn the wrapping machine over by hand and which may run continuously shall be a smooth, solid disk wheel.

(ii) At the discharge end (or drive side) of the crossfeed conveyor there shall be either a one- or two-piece guard in front of the crossfeed chain.

(iii) Electrical heaters on wrappers shall be protected by a cover plate properly separated or insulated from the heaters in order that accidental contact with this cover plate will not cause a burn to the operator.

(iv) Electric wiring for the wrapper heaters shall be so arranged that a minimum number of wires are used to connect the movable heaters assembly to the permanent wiring of the machine. This wiring shall be heat-resisting type in accordance with the requirements of § 1910.320.

(v) Power-driven friction rollers used to feed paper into the wrapping machine shall be provided with a guard over the in-running nip point of the rubber rollers.

(vi) The nip point, between the chain and sprocket of the loose wrap attachment, shall be completely enclosed or guarded on both sides in such a way that employee's fingers cannot get into this nip point.

(vii) Sprocket, chain, and V-belt drives on wrappers shall be completely enclosed.

(k) *Biscuit and cracker equipment*—(1) *Meal, peanut, and fig grinders.* (i) If the hopper is removable it shall be provided with an electric interlock so that the machine cannot be put in operation when the hopper is removed.

(ii) Where grid guards cannot be used, feed conveyors to hoppers, or baffle-type hoppers, shall be provided. Hoppers in such cases shall be enclosed and provided with hinged covers, and equipped with electric interlock to prevent operation of the machine with the cover open.

(2) *Sugar and spice pulverizers.* (i) All drive belts used in connection with sugar and spice pulvizers shall be grounded by means of metal combs or other effective means of removing static electricity. All pulverizing of sugar or spice grinding shall be done in accord-

ance with NFPA 62—1967 (Standard for Dust Hazards of Sugar and Cocoa), NFPA 656—1959 (Standard for Dust Hazards in Spice Grinding Plants).

(ii) Magnetic separators shall be provided to reduce fire and explosion hazards.

(3) *Cheese, fruit, and food cutters.* These machines shall be protected in accordance with the requirements of subparagraph (1) of this paragraph.

(4) *Jam, icing, and marshmallow beaters of horizontal tub type.* All top openings shall be provided with covers attached to the machines.

(5) *Reversible dough brakes.* Reversible brakes shall be provided with a guard or tripping mechanism on each side of the rolls. These guards shall be so arranged as to stop the machine or reverse the direction of the rolls so that they are outrunning if the guard is moved by contact of the operator.

(6) *Cross-roll brakes.* Cross - roll brakes shall be provided with guards that are similar in number and equal in effectiveness to guards on hand-fed brakes.

(7) *Box- and roll-type dough sheeters.* (i) Sheeting rolls shall be guarded at the point where the dough enters the rolls so that the operator's fingers cannot get into the nip point.

(ii) Hoppers for sheeters shall have an automatic stop bar or automatic stopping device along the back edge of the hopper. If construction does not permit location at the back edge, the automatic stop bar or automatic stopping device shall be located where it will be most effective to accomplish the desired protection.

(8) *Cutting and panning, embossing, peeling, bar, and frutana machines.* (i) Roll stands, other than hand fed, shall be guarded at the point where the dough enters the rolls so that the operator's fingers cannot get into the nip points.

(ii) Guards shall be provided at each side of the cutter to prevent hands from getting under the cutter.

(iii) Reciprocating panner heads shall be guarded to protect the operator from being caught between moving and stationary parts.

(iv) Motor control buttons shall be located within view of the cutting head.

(9) *Rotary, die machines, pretzel rolling, and pretzel-stick extruding machines.* Dough hoppers shall have the entire opening protected with substantial grid-type guards to prevent the employee from getting his hands caught in moving parts, or the hopper shall be extended high enough so that the operator's hands cannot get into moving parts.

(10) *Band ovens.* Band ovens shall be so arranged, or guarded, that the operator cannot get caught at the nip point between the band and the drive pulley or the takeup pulley, or between the oven conveyor and the oven frame.

(11) *Wafer-cutting machines.* These machines shall be so guarded that it will be impossible for employee's fingers or hands to come in contact with the saws or knives while feeding the machine.

(12) *Pan cooling towers.* (i) Where pan cooling towers extend to two or more floors, a lockout switch shall be provided on each floor in order that mechanics working on the tower may positively lock the mechanism against starting. Only one start switch shall be used in the motor control circuit.

(ii) All unused sides of pan cooling tower conveyors shall be enclosed or effectively guarded to a height of 7 feet above each floor.

(iii) Wherever a pan cooling tower conveyor passes through a floor, the opening shall be protected by a standard railing and toe board, or by other equivalent protection.

(iv) Wherever a pan conveyor passes over a main aisleway, regularly occupied work area, or passageway, the underside of the conveyor shall be completely enclosed to prevent pans, broken chains, or other material from falling in the aisleway, work area or passageway.

(v) Sprocket wheels of pan conveyors shall be enclosed so that accidental contact cannot be made at the point where the chain comes in contact with the sprocket.

(vi) Wherever conveyor bars, flights, and attachments pass in opposite directions within 6 inches of each other, a sheet metal partition or screen with openings no larger than one-half inch shall be placed between the conveyor chains which run in opposite directions.

(13) *Chocolate melting, refining, and mixing kettles.* Each kettle shall be provided with a cover to enclose the top of the kettle. The bottom outlet of each kettle shall be of such size and shape that the operator cannot reach in to touch the revolving paddle or come in contact with the shear point between the paddle and the side of the kettle.

(14) *Caddie, cover, and box stitchers (wire stitchers).* A guard shall be mounted on the stitching head to prevent operators from getting fingers caught between the stitching head and the clincher block.

(15) *Carton-wrapping and bundling machines.* The end seal drums on carton and bundling machines shall be provided with guards.

(16) *Carton and lining feeding machines.* Cutting knives shall be provided with a hinged hood to cover the knives. These guards shall be electrically interlocked to stop the machine if they are removed.

(17) *Peanut cooling trucks.* Mechanically operated peanut cooling trucks shall have a grid-type cover over the entire top.

(1) *Ovens*—(1) *General location.* (i) Ovens shall be located with due regard to the possibility of fire resulting from overheating or from the escape of gas or fuel oil and the possibility of injury to persons resulting from explosions.

(ii) Ovens shall be built on noncombustible foundations; excepting that where unusual circumstances require that an oven be placed on a combustible floor, the sole of the oven itself shall be insulated and shall be separated from the floor by a ventilated air space of at least 3 inches. In no case shall the temperature of a combustible floor beneath an oven be permitted to exceed 160° F.

(iii) Sufficient insulation shall be used in the crown of any oven, and the space above this crown shall be sufficiently ventilated, to prevent the temperature of any combustible ceilings from rising above 200° F.

(iv) Where oven ducts or stacks pass through combustible walls or ceilings, sufficient clearance and insulation shall be provided to keep the temperature of combustible material below 160° F.

(v) Columns or structural members of a building shall not pass through an oven. When such columns or structural members are closer than 6 inches to the inner shell of an oven, fireproof material shall be used and insulated in such a way that the temperature of the column or structural member will be kept below 160° F.

(vi) Ovens shall be located so as to be accessible from all sides and adequately spaced to permit the proper functioning of explosion vents.

(vii) Ovens shall be located so that possible fire or explosion will not expose groups of persons to possible injury. For this reason ovens shall not adjoin lockers, lunch or sales rooms, main passageways, or exits.

(2) *Recommended construction.* (i) structural parts of ovens shall be protected against corrosion or deterioration.

(ii) Roofs and other parts of ovens shall be structurally strong enough to support the weight of men who may be required to climb on top of ovens or inside of them.

(3) *Safeguards of mechanical parts.* (i) Emergency stop buttons shall be provided on mechanical ovens near the point where operators are stationed.

(ii) All piping at ovens shall be tested to be gastight.

(*a*) Soldered pipe joints shall not be permitted in connection with ovens. Pipe joints may be either screwed, flanged, or welded, in connection with ovens where such pipes carry fuel or steam.

(*b*) All pipe and fittings used shall be of good material, clear and free from cutter burrs and defects in structure or threading.

(iii) Main shutoff valves, operable separately from any automatic valve, shall be provided to permit turning off the fuel or steam in case of an emergency.

(*a*) Main shutoff valves shall be located so that explosions, fires, etc. will not prevent access to these valves.

(*b*) Main shutoff valves shall be locked in the closed position when men must enter the oven or when the oven is not in service.

(4) *Gas-burning systems.* (i) Liquefied petroleum gas shall be stored and distributed in accordance with the requirements of § 1910.110.

(ii) Inspirators on atmospheric (low-pressure) gas-burning systems shall be so constructed and machined as to insure correct alignment of the gas jet with the axis of the inspirator. Air adjustments or shutters on inspirators on atmospheric gasburning systems shall either be permanently fixed or else provided with a locking device to positively prevent accidental change of setting. The shutter shall be so located that adjustments can be made when the oven is in normal operating condition.

(iii) Dampers controlling the draft on ovens equipped with atmospheric gas-burning systems shall be interconnected with the gas supply so that no gas can be admitted to the burners if the damper is closed.

(*a*) Atmospheric pipe burners extending into the baking chamber of ovens fired with atmospheric gas-burning systems shall have secondary air ducts installed below each burner and extending over its full length. Air inlets for these ducts shall be placed outside the baking chamber.

(*b*) Stack dampers on ovens equipped with atmospheric gas-burning systems shall have a hole of the following diameter:

Diameter of flue	*Diameter of opening*
3 to 5	½
6 to 10	1
11 to 15	1½

Dimensions given in inches.

(iv) Nozzle or blast burners on atmospheric gas-burning systems shall be equipped with gas pilots or electric ignition; with the exception that burners operated on a maximum-minimum flame or modulating principle which are equipped with quick acting combustion safeguards actuated by the main burner flame may be equipped with automatic or hand torch ignition to be used for initial lighting only.

(v) Burners of the perforated pipe, ribbon, slot, tip, or similar types, having many individual ports, shall be capable of maintaining a stable flame over the entire length (or surface) of the burner throughout the turndown range and under all draft conditions which may arise in the operation of the oven, unless ignition of gas from every port shall immediately result from the ignition of gas at any single port, when gas is supplied to the burner at the highest and lowest rating of the burners.

(vi) Premixed gas burners shall be so designed that the burner will not backfire or blow off within the operating range of the burner.

(*a*) Multiple port burners, such as ribbon, strip, or tip burners, when used on premixed gas systems, shall be capable of instant ignition of the burner over its entire length when operated within the proper range of the burner, either in a normal or steam-laden oven atmosphere or under any other oven conditions which might extinguish the flame.

(*b*) Where a number of premixed gas burners are connected to a single premixing device, each burner shall be equipped with electric or gas ignition.

(vii) High-pressure inspirators (using gas at pressures exceeding 1 p.s.i.) shall be so constructed and machined as to insure perfect alignment of the gas jet with the axis of the inspirator.

(*a*) No high-pressure inspirator shall be installed with a valve or other obstruction between the inspirator and the burner.

(*b*) Each high-pressure inspirator shall have a gas adjustment consisting of a fixed replaceable orifice or an adjustable orifice. When an adjustable orifice is used, the adjusting screw shall be protected by a gas-tight plug.

(*c*) Air adjustments on high-pressure inspirators shall be provided with positive locking means.

(*d*) High-pressure inspirators shall be so located that air adjustments can be made during the operation of the oven.

(*e*) High-pressure inspirators shall be mounted in such a position that should a backfire occur, it cannot injure the operator or ignite any combustible material.

(*f*) High-pressure inspirators used on gas-burning systems, which are supplied under pressure with a partial mixture of air and gas instead of straight gas, shall not be used unless the amount of air mixed with the gas is sufficiently low to keep the mixture rich enough to be above the upper explosive limit.

(*g*) Low-pressure proportioning inspirating sets (using air at pressures from one-half to 1½ p.s.i. and gas at or about atmospheric pressure) shall be equipped with a positive locking device on the adjustment for setting the gas-air ratio.

(viii) Low-pressure proportioning inspirators equipped with zero governors, which do not compensate for any change in resistance in the mixture pipe, shall be installed so that there is no valve or other obstruction between the inspirators and the burners. Diaphragm air spaces of governors on low-pressure proportioning inspirating sets shall be vented to the outside of the building.

(ix) Two-pipe systems: No valve or other obstruction shall be placed between the mixing valve and the burners on any two-pipe system which uses air and gas under pressure, unless the mixing valve is equipped with a device which automatically will prevent excessive pressure rise in the mixture pressures. Two-pipe systems shall be equipped with means for cleaning the air and gas before they enter the mixing valve.

(5) *Gas mixing machines.* (i) All burners supplied with complete mixture from the machine shall be equipped with flash and flame arrestors equipped with automatic shutoff valves actuated by heat installed as close to the burners as practical and also at the outlet of the premixing machine ahead of the individual burner shutoffs. This is to prevent the flame from reaching the mixture supply pipe.

(*a*) The main mixture lines and the gas machine proper shall be amply protected against fire or explosion hazard by flashback arrestors and relief vents or softheads located outside the building. Some gas mixing machines are used for partially premixing gas and air and supplying this mixture to high-pressure inspirators where additional air is entrained. If the gas-air ratio is such that the mixture remains so rich as to be above the upper explosive limit over the entire range of the machine, flash arrestors or explosion vents are not required. Positive means shall be provided which will prevent any such gas mixing machine from producing an explosive mixture.

(*b*) All diaphragm or similar chambers shall be connected to the atmosphere outside of the building.

(*c*) An automatic safety shutoff valve shall be provided in the gas line leading to the mixing valve which will close the gas supply in case the suction disappears at the compressor inlet or the current to the compressor is shutoff.

(*d*) Air inlets to gas mixing machines shall be piped to a location outside the building and shall be located at a point protected against dust.

(ii) No valve or obstruction shall be installed between mixing blowers and burners.

(*a*) Mixing blowers shall be so constructed that they will supply a mixture of air and gas that will not blow off or backfire over the entire range of adjustments.

(*b*) Mixing blowers shall be provided with a pressure regulator in the gas line at the inlet to the mixing valve (to prevent variations in the air-gas ratio).

(*c*) Housings of mixing blowers shall be constructed to withstand any possible internal explosion.

(*d*) Mixing blowers shall be provided with an automatic safety shutoff valve in the gas line leading to the blower, which safety shutoff valve will close in case of failure of either gas pressure or electric current.

(6) *Oil-burning equipment.* (i) The storage and distribution of fuel oil in bakeries shall be arranged according to reference NFPA 31—1968 Standard for Installation of Oil Burning Equipment.

(ii) Oil burners shall be of a type approved by Underwriters Laboratories, Inc.

(*a*) Each oil burner shall be equipped with an electric ignition or gas pilot.

(*b*) Oil burners shall be protected against flame failure and overflowing of oil by a quick-acting combustion safeguard operated by the main burner flame. The time interval between flame failure and fuel shutoff shall be short enough to prevent a dangerous accumulation of an explosive mixture or the entry of a dangerous amount of fuel oil into the heating system; with the exception that on ovens requiring 150,000 B.t.u. per hour or less any combustion safeguard listed by the Underwriters Laboratories, Inc., may be used.

(*c*) The shutting off of the fuel supply shall be accomplished by stopping the individual burner pump equipped with a pressure cutoff valve, or by closing a suitable valve.

(*d*) Oil-fired ovens shall have dampers so arranged that a small amount of air is passed through the furnace at all times.

(*e*) Oil burners capable of being withdrawn from the furnace (for adjustment, etc.) shall be provided with an interlock which will prevent the burner from starting when in the withdrawn position.

(*f*) Preheating of oil, where necessary, shall be done by steam, hot water, or electric heater, and shall be thermostatically controlled. Heaters shall be substantially constructed with all joints made oil tight. Thermometers shall be installed at suitable locations to indicate the temperature of the heated oil. Heaters shall be bypassed or provided with suitable means to prevent abnormal pressure.

(*g*) Oil burners equipped with mechanical means for supplying air shall have an interlock between the air pressure and the oil supply so that the burner cannot operate unless air for proper combustion is available.

(iii) High-pressure atomizing oil burners shall be provided with a pressure cutoff valve between the pump and the nozzle.

(iv) Air atomizing burners equipped with maximum-minimum or modulating controls, and which are arranged to have the ignition turned off after initial lighting has been accomplished, shall be equipped with a quick-acting flame safeguard directly actuated by the main flame of the burner.

(v) Mechanical atomizing burners of the rotary type shall be operated on the on-off principle and shall be equipped with safeguards actuated by the main flame.

(vi) Evaporator-type burners shall be installed in such a way that provision is made to open the draft damper before oil can be admitted to the burners.

(vii) Burners supplied by "vapofiers" shall be equipped with a protected gas or electric pilot. In combination vapofier-gas heating systems, the burner shall be protected in accordance with the requirements of subparagraph (4) of this paragraph.

(7) *Solid-fuel firing equipment.* (i) In solid-fuel firing systems proper draft shall be maintained at the stack as long as there is fuel in the furnace. All breachings and flues shall be kept in a tight and clean condition. Solid-fuel firing systems using forced draft shall have the air supply to the ash pit interconnected with the furnace in such a way that the air pressure is shut off when the furnace door is opened.

(ii) *Mechanical stokers.* (*a*) Fuel feed and air supply to mechanical stokers shall be interlocked in such a way that fuel cannot be fed without sufficient air being available.

(*b*) Dampers in mechanical-stoker fired systems shall be interlocked with the stoker in such a way that the stoker cannot be started unless the damper is open.

(8) *Electrical heating equipment.* (i) All electrical equipment shall be built and installed according to Subpart S of this part.

(ii) Open heating elements inside the baking chamber shall be guarded against accidental touching by the product being baked, by the body of the operator, or by current-conducting implements which may be used.

(iii) A main disconnect switch or circuit breaker shall be provided. This switch or circuit breaker shall be so located that it can be reached quickly and safely. The main switch or circuit breaker shall have provisions for locking it in the open position if any work on the electrical equipment or inside the oven must be performed.

(9) *General requirements.* (i) Protecting devices shall be properly maintained and kept in working order.

(ii) All safety devices on ovens shall be inspected at intervals of not less than twice a month by an especially appointed, properly instructed bakery employee, and not less than once a year by representatives of the oven manufacturers.

(iii) (*a*) Protection of gas pilot lights shall be provided when it is impracticable to protect the main flame of the burner and where the pilot flame cannot contact the flame electrode without being in the path of the main flame of the burner. Failure of any gas pilot shall automatically shut off the fuel supply to the burner.

(*b*) Ovens with multiple burners shall be equipped with individual atmospheric pilot lights where there is sufficient secondary air in the baking chamber and where gas is available; or else each burner shall be equipped with an electric spark-type ignition device.

(iv) Burners of a capacity exceeding 150,000 B.t.u. per hour equipped with electric ignition shall be protected in addition by quick-acting combustion safeguards.

(*a*) The high-tension current for any electric spark-type ignition device shall originate in a power supply line which is interlocked with the fuel supply for the oven in such a way that in case of current failure both the source of electricity to the high-tension circuits and the fuel supply shall be turned off simultaneously.

(*b*) All electric circuits in connection with ignition systems on ovens shall comply with Subpart S of this part.

(*c*) Combustion safeguards used in connection with electric ignition systems on ovens shall be so designed as to prevent an explosive mixture from accumulating inside the oven before ignition has taken place.

(v) When fuel is supplied and used at line pressure, safety shutoff valves shall be provided in the fuel line leading to the burner.

(*a*) When fuel is supplied in excess of line pressure, safety shutoff valves shall be provided in the fuel line leading to the burners, unless the fuel supply lines are equipped with other automatic valves which will prevent the flow of fuel when the compressing equipment is stopped.

(*b*) The safety shutoff valve shall be positively tight and shall be tested at least twice monthly.

(*c*) Packing glands shall be designed so that the valve will not be made inoperative by excessive tightening of the packing gland.

(*d*) Electrically operated safety shutoff valves shall be normally closed and not depend on electricity for shutting off the fuel supply.

(*e*) A safety shutoff valve shall require manual operation for reopening after it has closed, or the electric circuit shall be so arranged that it will require a manual operation for reopening the safety shutoff valve.

(*f*) Manual reset-type safety shutoff valves shall be so arranged that they cannot be locked in an open position by external means.

(*g*) Where blowers are used for supplying the air for combustion the safety shutoff valve shall be interlocked so that it will close in case of air failure.

(*h*) Where gas or electric ignition is used, the safety shutoff valve shall close in case of ignition failure. On burners equipped with combustion safeguards, the valve shall close in case of burner flame failure.

(vi) One main, manually operated, fuel shutoff valve shall be provided on each oven, and shall be located ahead of all other valves in the system.

(vii) All individual gas or oil burners with a heating capacity over 150,000 B.t.u. per hour shall be protected by a safeguard which is actuated by the flame and which will react to flame failure in a time interval not to exceed 2 seconds. All safeguards, once having shut down a gas or oil burner, shall require manual resetting and starting of the burner or burners.

(viii) Any space in an oven (except direct fired ovens) which could be filled with an explosive mixture shall be protected by explosion vents. Explosion vents shall be made of minimum weight consistent with adequate insulation.

(*a*) Explosion doors which have a substantial weight shall be attached by chains or similar means to prevent flying parts from injuring the personnel in case of an explosion.

(*b*) Where explosion vents are so located that flying parts or gases might endanger the personnel working on or near the oven, internal or external protecting means shall be provided in the form of heavily constructed shields or deflectors made from noncombustible material.

(*c*) Specifically exempted from the provisions of subdivision (viii) of this subparagraph are heating systems on ovens in which the fuel is admitted only to enclosed spaces which shall have been tested to prove that their construction will resist repeated explosions without deformation are exempt from the requirements of subdivisions (viii) (*a*) and (*b*) of this paragraph.

(ix) *Flues and dampers.* (*a*) All ovens (except electrically heated) shall be properly and firmly connected to an active chimney or flue of ample size to carry away the flue gases.

(*b*) The chimney shall be preinspected after installation or repair to determine whether it is in suitable condition.

(*c*) The flue pipe or breeching shall be properly supported in all cases.

(*d*) Means shall be employed which will prevent the flue pipe or breeching from entering beyond the inner wall of the chimney flue.

(*e*) Flue pipe shall be cemented or otherwise sealed to the chimney wall so as to prevent infiltration of air.

(*f*) A flue damper or other equivalent means for regulating draft shall be installed on each oven, the proper operation of which depends on natural draft.

(*g*) Dampers, where used, shall be equipped with suitably located minimum and maximum stops. The minimum stop for dampers shall be adjusted to obtain sufficient air for combustion at the minimum oven output. Where stack dampers are used in connection with oil- or gas-fired ovens, they shall be equipped with means to turn the burner off when the damper is closed.

(x) Where the initial pressure of the fuel is lower than the air pressure used for combustion, check valves shall be installed in the fuel line to prevent air from backing up into the fuel lines. For instance, in gas burner apparatus, which uses air at pressures exceeding the gas service pressure, a check valve shall be provided in the gas line next to the mixing device.

(xi) Where the gas supply pressure is substantially higher than that at which the burners of an oven are designed to operate, a gas pressure regulator shall be employed.

(*a*) Gas pressure regulators, where used, shall maintain the gas pressure to the manifold within 10 percent of the operating pressure from maximum to minimum consumption rates.

(*b*) Regulators shall be of the spring-loaded, dead-weight, or pressure-balanced type. Spring- or weight-loaded regulators shall have springs or weights covered by suitable housing. Under no circumstances shall a weight and lever type of regulator be used.

(*c*) A gas pressure regulator, requiring access to atmosphere for successful operation, shall be vented to the outer air.

(*d*) A relief valve shall be placed on the outlet side of gas pressure regulators where gas is supplied at high pressure. The discharge from this valve shall be piped to the outside of the building.

(xii) All chambers which have to be connected to the atmosphere, but are separated from any gaseous or other volatile fuel by a flexible membrane, as, for instance, a diaphragm, bellows, etc., shall be connected by a pipe of at least one-half inch size to the outside atmosphere. The outside end of this pipe shall be protected against flooding or accidental plugging by ice formation, insects, or other causes, by providing a "tee" with double elbow connections pointing downwards at the top of the pipe, and screened outlets. Where several of such chambers are used in close proximity, a common vent line may be used.

(xiii) Where accumulation of dust in the air supply might affect the proper functioning of mixing devices and burners, the air supply inlet shall be equipped with suitable air filters. A standby filter should be available to permit interchanging filters for cleaning purposes.

(10) *Direct-fired ovens.* (i) Direct-fired ovens shall be safeguarded against failure of fuel, air, or ignition.

(ii) To prevent the possible accumulation of explosive gases from being ignited after a shutdown, all direct-fired ovens with a heating capacity over 150,000 B.t.u. per hour shall be ventilated before the ignition system, combustion air blower, and the fuel can be turned on. The preventilation shall insure at least four complete changes of atmosphere in the baking chamber by discharging the oven atmosphere to the outside of the building and entraining fresh air into it. The preventilation shall be repeated whenever the heating equipment is shut down by a safety device.

(11) *Direct recirculating ovens.* (i) Each circulating fan in direct recirculating ovens shall be interconnected with the burner in such a manner that the fuel is shut off by a safety valve when the fan is not running.

(ii) The flame of the burner or burners in direct recirculating ovens shall be protected by a quick-acting flame-sensitive safeguard which will automatically shut off the fuel supply in case of burner failure.

(iii) Direct recirculating ovens shall be equipped with preventilating devices.

(iv) Fans in direct recirculating ovens shall be constructed of materials suitable for the temperatures at which they will operate and designed with an ample safety factor to prevent rupture of the wheel.

(v) Fan wheel in direct recirculating oven shall be protected against direct impingement of the flame of the burner or burners.

(vi) Direct recirculating ovens, and particularly fans in and on such ovens, shall be protected from overheating by means of a temperature limiting device.

(vii) When the burner or burners on direct recirculating ovens are mounted at elevated positions permanent steps shall be provided for safe and convenient access to the burner or burners.

(12) *Flue-type ovens.* (i) Flue-type ovens shall be operated in such a way that less than atmospheric pressure is maintained in the flues.

(ii) Gas burners in flue-type ovens shall be protected against flame failure.

(iii) Oil burners on flue-type ovens shall be equipped with combustion safeguards as listed by the Underwriters Laboratories, Inc.

(iv) Solid-fuel stoker-fired flue-type ovens shall have the stack damper interlocked with the stoker so that the stoker cannot be operated when the damper is closed.

(13) *Indirect-fired multiple burner ovens.* (i) Indirect-fired multiple-burner ovens shall be equipped with safety shutoff valves which are interlocked with the ignition system, the air pressure and the gas pressure.

(ii) Parts of enclosures reaching through the wall of indirect-fired multiple-burner ovens, and observation windows on such ovens, shall be tested at least once each year with repeated explosions, and afterward inspected for leaks.

(14) *Steam-tube ovens.* Steam-tube ovens shall be protected against overfiring (firing at an excessive rate) and overheating (heating to excessive temperatures) by devices which control the maximum amount of fuel admitted to the furnace and the maximum permissible temperature in the baking chamber.

(15) *Indirect recirculating ovens.* (i) Indirect recirculating ovens shall have all oil and gas burners equipped with quick-acting flame sensitive combustion safeguards.

(ii) Duct systems in indirect-recirculating ovens shall be protected by explosion vents having a minimum total area of 1 square foot of vent to 15 cubic feet of total duct volume. These explosion vents shall be so located that they will not release hot gases or flying parts in the direction of an operator.

(iii) Duct systems (in ovens) operating under pressure shall be tested for tightness in the initial starting of the oven and also at intervals not farther apart than 6 months.

(iv) Fans and other parts in indirect recirculating ovens shall comply with requirements as listed under subparagraph (11) of this paragraph.

(16) *Electric ovens.* Electric ovens shall be installed, operated, and maintained in accordance with Subpart S of this part.

§ 1910.264 Laundry machinery and operations.

(a) *Definitions applicable to this section.* (1) *Laundry.* The term "laundry" shall mean an establishment wherein the washing, ironing, or other finishing of clothes, or any other textiles is done, but excluding printing, bleaching, dry cleaning, or dyeing of clothes or other textiles.

(2) *Marking machine.* The term "marking machine" shall mean a power-driven machine used for marking clothes or other textiles.

(3) *Washing machine.* The term "washing machine" shall mean a power-driven machine used for washing clothes or other textiles. It generally consists of a stationary case or shell inside of which is a revolving perforated cylinder.

(4) *Extractor.* The term "extractor" shall mean a power-driven centrifugal machine used for removing surplus moisture from clothes or other textiles by centrifugal action.

(5) *Wringer.* The term "wringer" shall mean one or more power-driven rolls used for removing surplus moisture from clothes or other textiles.

(6) *Starch mixer.* The term "starch mixer" shall mean a power-driven machine used for mixing or processing starch.

(7) *Starching machine.* The term "starching machine" shall mean a power-driven machine used for the starching of clothes or other textiles.

(8) *Drying tumbler.* The term "drying tumbler" shall mean a machine within which clothes or other textiles are dried by air, and which usually consists of an enclosure inside of which is a revolving cylinder.

(9) *Shaker.* The term "shaker" (clothes tumbler) shall mean a revolving cylinder used for shaking out clothes or other textiles.

(10) *Drying room.* The term "drying room" shall mean an enclosure used for drying clothes or other textiles, and containing any power-driven mechanism.

(11) *Dampening machine.* The term "dampening machine" shall mean a machine used for dampening clothes or other textiles.

(12) *Ironer*. The term "ironer" shall mean a hand- or power-operated machine, with one or more rolls or heated surfaces in contact, used for ironing or smoothing clothes or other textiles.

(13) *Shaping machine*. The term "shaping machine" shall mean a power-driven machine used to shape, mold, or otherwise finish clothes or other textiles; this term shall also include shaping tables, stands, or shelves upon which the machine may be mounted.

(14) *Sewing machine*. The term "sewing machine" shall mean a machine used for sewing or stitching clothes or other textiles.

(15) *Guarded*. The term "guarded" shall mean covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers or casings, barrier rails, safety bars, or screens, to eliminate the possibility of accidental contact with, or dangerous approach by, persons or objects.

(16) *Enclosed*. The term "enclosed" shall mean that the object or equipment or part thereof is so guarded that accidental contact at the point of danger, during the regular operation of the equipment, is not possible.

(17) *Safety interlock*. The term "safety interlock" shall mean a device that will prevent the operation of the machine while the cover or door is open or unlocked and will hold the cover or door closed and locked while the basket or cylinder is in motion.

(18) *Moving parts*. The term "moving parts" shall mean gears, sprockets, revolving shafts, clutches, belts, pulleys, or other revolving or reciprocating parts that are attached to, or form an integral part of, a machine.

(19) *Power transmission*. The term "power transmission" shall pertain to equipment such as shafting, gears, belts, pulleys, or other parts used for transmitting power to the machine, and shall include prime movers.

(20) *Prime movers*. The term "prime movers," shall include steam, gas, oil, and air engines or motors, and steam and hydraulic turbines.

(21) *Point of operation*. The term "point of operation" shall mean the point or points at which clothes or other textiles are inserted or manipulated in the operation of the machine.

(b) *General requirements*. This section applies to moving parts of equipment used in laundries and to conditions peculiar to this industry, with special reference to the point of operation of laundry machines. This section does not apply to dry-cleaning operations.

(c) *Point-of-operation guards*—(1) *Washroom machines*—(i) *Marking machine*. Each power marking machine shall be equipped with a spring-compression device of such design as to prevent injury to fingers, should they be caught between the marking plunger and platen; or the marking machine shall be equipped with a control mechanism that will require the simultaneous action of both hands to operate the machine; or there shall be a guard that will act as a barrier in front of, and which will prevent the operator's fingers from coming into contact with, the marking plunger.

(ii) *Washing machine*. (*a*) Each washing machine shall be equipped with an interlocking device that will prevent the inside cylinder from moving when the outer door on the case or shell is open, and will also prevent the door from being opened while the inside cylinder is in motion. This device should not prevent the movement of the inner cylinder under the action of a hand-operated mechanism or under the operation of an "inching device."

(*b*) Each washing machine shall be provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded.

(iii) *Extractor*. (*a*) Each extractor shall be equipped with a metal cover.

(*b*) Each extractor shall be equipped with an interlocking device that will prevent the cover from being opened while the basket is in motion, and will also prevent the power operation of the basket while the cover is not fully closed and secured. This device should not prevent the movement of the basket by hand to ensure an even loading.

(*c*) Each extractor shall also be effectively secured in position on the floor or foundation so as to eliminate unnecessary vibrations, and shall not be operated at a speed greater than that given in the manufacturer's rating, which shall be stamped on the inside of the basket where it is easily visible, in letters not less than one-fourth inch in height. The maximum permissible speed shall be given in revolutions per minute.

(*d*) Each engine individually driving an extractor shall be provided with an engine stop approved by Underwriters Laboratories, Inc., and a speed-limit governor. It is suggested that where an extractor is driven by a direct-current motor a "no field" release be installed to prevent overspeed, which may result from an open or broken field.

(iv) *Power wringer*. Each power wringer shall be equipped with a safety bar or other guard across the entire front of the feed or first pressure rolls, so arranged that the striking of the bar or guard by the hand of the operator or other person will stop the machine.

(2) *Starching and drying machines*—(i) *Starching machine (cylinder or box type)*. Each starching machine, cylinder or box type, shall be enclosed or guarded so as to prevent the operator or other person from coming into accidental contact with the cylinder or box while the machine is in motion.

(ii) *Drying-room fan*. Each drying-room fan, any part of which is within 7 feet of the floor or working platform, shall be guarded with wire mesh or screen of not less than No. 16 gage, the openings of which will reject a ball one-half inch in diameter.

(iii) *Drying tumbler*. (*a*) Each drying tumbler shall be equipped with an interlocking device that will prevent the inside cylinder from moving when the outer door on the case or shell is open, and also prevent the door from being opened while the inside cylinder is in motion. This device should not prevent the movement of the inner cylinder under the action of a hand-operated mechanism or under the operation of an inching device.

(*b*) Each drying tumbler shall be provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded.

(iv) *Shaker (clothes tumbler)*. (*a*) (*1*) Each shaker or clothes tumbler of the single-cylinder type shall be equipped with a device that will automatically prevent the tumbler from moving while the door is open.

(*2*) The tumbler shall also be enclosed or guarded so as to prevent accidental contact by the operator or other person while the machine is in motion.

(*b*) (*1*) Each shaker or clothes tumbler of the double-cylinder type shall be equipped with an interlocking device that will prevent the inside cylinder from moving when the outer door on the case or shell is open, and will also prevent the door from being opened while the inside cylinder is in motion. This device should not prevent the movement of the inner cylinder under the action of a hand-operated mechanism or under the operation of an inching device.

(*2*) Each shaker or clothes tumbler of the double-cylinder type shall be provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded.

(v) *Exception*. Provisions of subdivision (iii), (iv) (*a*) (*1*), and (iv) (*b*) of this subparagraph shall not apply to shakeout or conditioning tumblers where the clothes are loaded into the open end of the revolving cylinder and are automatically discharged out of the opposite end.

(3) *Finishing machines*—(i) *Dampening machine*. Each roll-dampening machine shall be so equipped that the rolls will be entirely enclosed and so arranged as to prevent the fingers of the operator or other person from being caught between the rolls. This may be accomplished by:

(*a*) A slot or hopper;

(*b*) A rod or strip located directly in front of the feed and extending the full length of the rolls.

(ii) *Ironer*. (*a*) Each flat-work or collar ironer shall be equipped with a safety bar or other guard across the entire front of the feed or first pressure rolls, so arranged that the striking of the bar or guard by the hand of the operator or other person will stop the machine. The pressure rolls shall be covered or guarded so that the operator or other person cannot reach into the rolls without removing the guard. This may be either a vertical guard on all sides or a complete cover. If a vertical guard is used, the distance from the floor or working platform to the top of guard shall be not less than 6 feet.

(*b*) Each body-type ironer, roll or shoe type, including sleeve and band ironers, shall be equipped with a safety bar or other guard across the entire length of the feed roll or shoe, so arranged that the striking of the bar or guard by the hand of the operator or other person will stop the machine. The hot roll or shoe shall also be covered in such a way that the operator or other person cannot come into contact with the heated surfaces.

(*c*) Each combined rotary-bosom and coat ironer shall be equipped with a safety bar or other guard across the entire length of the feed roll or shoe, so arranged that the striking of the bar or guard by the hand of the operator or other person will stop the machine. The hot roll or shoe shall also be covered in such a way that the operator or other person cannot come into contact with the heated surfaces.

(*d*) Each ironing press (excluding hand or foot powered ones) shall be equipped with a guard or means that will prevent the fingers of the operator or other person from being caught between the ironing surfaces.

(4) *Miscellaneous machines and equipment*—(i) *Sewing machine.* Each sewing machine shall be equipped with a guard permanently attached to the machine, so that the operator's fingers cannot pass under the needle. It shall be of such form that the needle can be conveniently threaded without removing the guard.

(ii) *Exhaust or ventilating fans.* Each exhaust or ventilating fan within 7 feet of the floor or working platform shall be completely covered with wire mesh of not less than No. 16 gage, and with openings that will reject a ball one-half inch in diameter.

(iii) *Steam pipes.* (*a*) All steam pipes that are within 7 feet of the floor or working platform, and with which the worker may come into contact, shall be insulated or covered with a heat-resistive material or shall be otherwise properly guarded.

(*b*) Where pressure-reducing valves are used, one or more relief or safety valves shall be provided on the low-pressure side of the reducing valve, in case the piping or equipment on the low-pressure side does not meet the requirements for full initial pressure. The relief or safety valve shall be located adjacent to, or as close as possible to, the reducing valve. Proper protection shall be provided to prevent injury or damage caused by fluid escaping from relief or safety valves if vented to the atmosphere. The vents shall be of ample size and as short and direct as possible. The combined discharge capacity of the relief valves shall be such that the pressure rating of the lower-pressure piping and equipment will not be exceeded if the reducing valve sticks or fails to open.

(iv) *Starting and stopping devices.* Each power-driven machine shall be provided with means for disconnecting from the source of power. Starting and stopping devices for machines shall be so located as to be operable from the front of the machine, and so constructed as to allow proper guarding of belts and pulleys.

(d) *Operating rules*—(1) *General*—(i) *Floors.*

(*a*) The floors of every room in a laundry that are used for washing purposes shall be properly constructed of cement, tile, or similar material. The floors shall be watertight, free from projections, crevices, or dangerous gradients. They shall be maintained in good repair and so drained that no water may accumulate.

(*b*) The floors of every room except washrooms shall be constructed of hardwood or any impervious material, free from protruding nails, splinters, or loose boards, and shall be maintained in a safe condition.

(ii) *Table tops, shelves, and machine woodwork.* Table tops, shelves, and machine woodwork shall be constructed of materials properly surfaced, finished free from splinters, and so maintained.

(iii) *Markers.* Markers and others handling soiled clothes shall be warned against touching the eyes, mouth, or any part of the body on which the skin has been broken by a scratch or abrasion; and they shall be cautioned not to touch or eat food until their hands have been thoroughly washed.

(iv) *Ventilation.* Where artificial ventilation is necessary to the maintenance of comfortable working conditions, an adequate ventilating system shall be installed.

(v) *Instruction of employees.* Employees shall be properly instructed as to the hazards of their work and be instructed in safe practices, by bulletins, printed rules, and verbal instructions.

(2) *Mechanical*—(i) *Safety guards.* (*a*) No safeguard, safety appliance, or device attached to, or forming an integral part of any machinery shall be removed or made ineffective except for the purpose of making immediate repairs or adjustments. Any such safeguard, safety appliance, or device removed or made ineffective during the repair or adjustment of such machinery shall be replaced immediately upon the completion of such repairs or adjustments.

(*b*) No machine shall be operated until such repairs and adjustments have been made and the machine is in good working condition.

(ii) *Steam-pressure apparatus.* Steam machines shall not be operated at a pressure above that given by the manufacturer's pressure rating as shown on name plate. If the steam source is at a pressure higher than that given by the manufacturer's rating, a stop valve, reducing valve, pressure gage, and safety valve shall be installed, in the order named, from the source. The safety valve shall be located in a nonhazardous place.

(iii) *Machine adjustments.* No moving parts of any machine shall be oiled, cleaned, adjusted, or repaired while said machine is in operation or in motion except that the rolls of adjusting machines not equipped with hand-power means shall be operated at the slowest speed possible with an operator constantly at the starting mechanism.

(iv) *Extractors.* Each extractor shall be dismantled and inspected at least once a year and, if necessary, repaired. Overdriven extractors, if provided with handholes through which basket and rings can be inspected, need not be dismantled.

(e) *Moving parts*—(1) *Machine guarding (other than point of operation).* Moving parts of machines, such as gears, sprockets, belts, pulleys, and shafts, shall be guarded in accordance with the requirements of § 1910.219.

(2) *Prime-mover guarding.* Moving parts of prime movers, such as flywheels, cranks and connecting rods, tail rods or extension piston rods, and governor balls, shall be guarded in accordance with the requirements of § 1910.219.

(f) *General industrial safety standards*—(1) *General.* The general safety standards adopted by reference in subparagraph (2) of this paragraph, the provisions of which apply to nearly every industrial plant, are now incorporated by reference in this section and are made applicable to laundry operations. The rules of construction set forth in paragraph (3) of § 1910.5 shall apply.

(2) *Additional requirements.* The employer shall comply with the provisions of the standards referenced in this subparagraph. In the event of any conflict between this subparagraph and paragraphs (b) through (e) of this section, the requirements of paragraphs (b) through (e) of this section shall apply.

(i) *Industrial lighting.* American National Standard Practice for Industrial Lighting, ANSI A11.1—1965 (R–1970).

(ii) *Floor and wall openings, railings, and toeboards.* American National Standard Safety Requirements for Floor and Wall Openings, Railings, and Toeboards, ANSI A12.1—1967.

(iii) *Identification of piping systems.* American National Standard Scheme for the Identification of Piping Systems, ANSI A13.1—1956.

(iv) *Mechanical power transmission apparatus.* American National Standard Safety Standard for Mechanical Power Transmission Apparatus, ANSI B15.1—1971.

(v) *Pressure piping—power piping.* American National Standard Code for Pressure Piping—Power Piping, ANSI 31.1.0—1967. Addenda to the American National Standard Code for Pressure Piping—Power Piping, ANSI B31.1.0a—1969.

(vi) *Sanitation.* American National Standard Requirements for Sanitation in Places of Employment, ANSI Z4.1—1968.

(vii) *Local exhaust systems.* American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2—1960.

(viii) *Gas appliances and gas piping.* American National Standard for the Installation of Gas Appliances and Gas Piping, ANSI Z21.30—1964.

§ 1910.265 Sawmills.

(a) *General requirements*—(1) *Application.* This section includes safety requirements for sawmill operations including, but not limited to, log and lumber handling, sawing, trimming, and planing; waste disposal; operation of dry kilns; finishing; shipping; storage; yard and yard equipment; and for power tools and affiliated equipment used in connection with such operations, but excluding the manufacture of plywood, cooperage, and veneer.

(2) *Incorporation of standards by reference.* Certain of the paragraphs of this section incorporate and apply occupational safety and health standards of general application without regard to any specific industry. Such standards shall apply to sawmill operations in accordance with the rules of construction set forth in § 1910.05.

(b) *Definitions applicable to this section*—(1) *A-frame.* The term "A-frame" means a structure made of two independent columns fastened together at the top and separated at the bottom for stability.

(2) *Annealing.* The term "annealing" means heating then cooling to soften and render less brittle.

(3) *Binder.* The term "binder" means a chain, cable, rope, or other approved material used for binding loads.

(4) *Boom.* The term "boom" means logs or timbers fastened together end to end and used to contain floating logs. The term includes enclosed logs.

(5) *Brow log.* The term "brow log" means a log placed parallel to a roadway at a landing or dump to protect vehicles while loading or unloading.

(6) *Bunk.* The term "bunk" means a cross support for a load.

(7) *Cant.* The term "cant" means a log slabbed on one or more sides.

(8) *Carriage (log carriage).* The term "carriage" means a framework mounted on wheels which runs on tracks or in grooves in a direction parallel to the face of the saw, and which contains apparatus to hold a log securely and advance it towards the saw.

(9) *Carrier.* The term "carrier" means an industrial truck so designed and constructed that it straddles the load to be transported with mechanisms to pick up the load and support it during transportation.

(10) *Chipper.* The term "chipper" means a machine which cuts material into chips.

(11) *Chock (bunk block) (cheese block).* The terms "chock", "bunk block", and "cheese block" mean a wedge that prevents logs or loads from moving.

(12) *Cold deck.* The term "cold deck" means a pile of logs stored for future removal.

(13) *Crotch lines.* The term "crotch lines" means two short lines attached to a hoisting line by a ring or shackle, the lower ends being attached to loading hooks.

(14) *Dog (carriage dog).* The term "dog" means a steel tooth, one or more of which are attached to each carriage knee to hold log firmly in place on carriage.

(15) *Drag saw.* The term "drag saw" means a power-driven, reciprocating crosscut saw mounted on suitable frame and used for bucking logs.

(16) *Head block.* The term "head block" means that part of a carriage which holds the log and upon which it rests. It generally consists of base, knee, taper set, and mechanism.

(17) *Head rig.* The term "head rig" means a combination of head saw and log carriage used for the initial breakdown of logs into timbers, cants, and boards.

(18) *Hog.* The term "hog" means a machine for cutting or grinding slabs and other coarse residue from the mill.

(19) *Husk.* The term "husk" means a head saw framework on a circular mill.

(20) *Industrial truck.* The term "industrial truck" means a mobile power-driven truck or tractor.

(21) *Kiln tender.* The term "kiln tender" means the operator of a kiln.

(22) *Lift truck.* The term "lift truck" means an industrial truck used for lateral transportation and equipped with a power-operated lifting device, usually in the form of forks, for piling or unpiling lumber units or packages.

(23) *Live rolls.* The term "live rolls" means cylinders of wood or metal mounted on horizontal axes and rotated by power, which are used to convey slabs, lumber, and other wood products.

(24) *Loading boom.* The term "loading boom" means any structure projecting from a pivot point to guide a log when lifted.

(25) *Log deck.* The term "log deck" means a platform in the sawmill on which the logs remain until needed for sawing.

(26) *Lumber hauling truck.* The term "lumber hauling truck" means an industrial truck, other than a lift truck or a carrier, used for the transport of lumber.

(27) *Log haul.* The term "log haul" means a conveyor for transferring logs to mill.

(28) *Package.* The term "package" means a unit of lumber.

(29) *Peavy.* The term "peavy" means a stout wooden handle fitted with a spike and hook and used for rolling logs.

(30) *Pike pole.* The term "pike pole" means a long pole whose end is shod with a sharp pointed spike.

(31) *Pitman rod.* The term "pitman rod" means connecting rod.

(32) *Resaw.* The term "resaw" means band, circular, or sash gang saws used to break down slabs, cants, or flitches into lumber.

(33) *Running line.* The term "running line" means any moving rope as distinguished from a stationary rope such as a guyline.

(34) *Safety factor.* The term "safety factor" means a calculated reduction factor which may be applied to laboratory test values to obtain safe working stresses for wooden beams and other mechanical members; ratio of breaking load to safe load.

(35) *Saw guide.* The term "saw guide" mean a device for steadying a circular or bandsaw.

(36) *Setwork.* The term "setwork" means a mechanism on a sawmill carriage which enables an operator to move the log into position for another cut.

(37) *Sorting gaps.* The term "sorting gaps" means the areas on a log pond enclosed by boom sticks into which logs are sorted.

(38) *Spreader wheel.* The term "spreader wheel" means a metal wheel that separates the board from the log in back of circular saws to prevent binding.

(39) *Splitter.* The term "splitter" means a knife-type, nonrotating spreader.

(40) *Sticker.* The term "sticker" means a strip of wood or other material used to separate layers of lumber.

(41) *Stiff boom.* The term "stiff boom" means the anchored, stationary boom sticks which are tied together and on which boom men work.

(42) *Swifter.* The term "swifter" is a means of tying boom sticks together to prevent them from spreading while being towed.

(43) *Telltale.* The term "telltale" means a device used to serve as a warning for overhead objects.

(44) *Top saw.* The term "top saw" means the upper of two circular saws on a head rig, both being on the same husk.

(45) *Tramway* The term "tramway" means a way for trams, usually consisting of parallel tracks laid on wooden beams.

(46) *Trestle.* The term "trestle" means a braced framework of timbers, piles or steelwork for carrying a road or railroad over a depression.

(c) *Building facilities, and isolated equipment*—(1) *Safety factor.* All buildings, docks, tramways, walkways, log dumps, and other structures shall be designed, constructed and maintained so as to support the imposed load in accordance with a safety factor.

(2) *Work areas.* Work areas under mills shall be as evenly surfaced as local conditions permit. They shall be free from unnecessary obstructions and provided with lighting facilities in accordance with American National Standard for Industrial Lighting All.1—1965.

(3) *Floors.* Flooring in buildings and on ramps and walkways shall be constructed and installed in accordance with established principles of mechanics and sound engineering practices. They shall be of adequate strength to support the estimated or actual dead and live loads acting on them with the resultant stress not exceeding the allowable stress for the material being used.

(i) *Floor and wall openings.* All floor and wall openings shall be protected as prescribed in § 1910.23.

(ii) *Areas beneath floor openings.* Areas under floor openings shall, where practical, be fenced off. When this is not practical, they shall be plainly marked and telltales shall be installed to hang over these areas.

(iii) *Floor maintenance.* The flooring of buildings, docks, and passageways shall be kept in good repair. When a hazardous condition develops that cannot be immediately repaired, the area shall be guarded until adequate repairs are made.

(iv) *Nonslip floors.* Floors, footwalks, and passageways in the work area around machines or other places where a person is required to stand or walk shall be provided with effective means to minimize slipping.

(4) *Walkways, docks, and platforms*—(i) *Width*. Walkways, docks, and platforms shall be of sufficient width to provide adequate passage and working areas.

(ii) *Maintenance*. Walkways shall be evenly floored and kept in good repair.

(iii) *Docks*. Docks and runways used for the operation of lift trucks and other vehicles shall have a substantial guard or shear timber except where loading and unloading are being performed.

(iv) *Elevated walks*. All elevated walks, runways, or platforms, if 4 feet or more from the floor level, shall be provided with a standard railing except on loading or unloading sides of platforms. If height exceeds 6 feet, a standard toe board also shall be provided to prevent material from rolling or falling off.

(v) *Elevated platforms*. Where elevated platforms are used routinely on a daily basis they shall be equipped with stairways or fixed ladders in accordance with § 1910.27.

(vi) *Hazardous locations*. Where required, walkways and stairways with standard handrails shall be provided in elevated and hazardous locations. Where such passageways are over walkways or work areas, standard toe boards shall be provided.

(5) *Stairways* — (i) *Construction*. Stairways shall be constructed in accordance with § 1910.24.

(ii) *Handrails*. Stairways shall be provided with a standard handrail on at least one side or on any open side. Where stairs are more than four feet wide there shall be a standard handrail at each side, and where more than eight feet wide, a third standard handrail shall be erected in the center of the stairway.

(iii) *Lighting*. All stairways shall be adequately lighted as prescribed in Subparagraph (9) of this paragraph.

(6) *Emergency exits including doors and fire escapes*—(i) *Opening*. Doors shall not open directly on or block a flight of stairs, and shall swing in the direction of exit travel.

(ii) *Identification*. Exits shall be located and identified in a manner that affords ready exit from all work areas.

(iii) *Swinging doors*. All swinging doors shall be provided with windows; with one window for each section of double swinging doors. Such windows shall be of shatterproof or safety glass unless otherwise protected against breakage.

(iv) *Sliding doors*. Where sliding doors are used as exits, an inner door shall be cut inside each of the main doors and arranged to open outward.

(v) *Barriers and warning signs*. Where a doorway opens upon a railroad track or upon a tramway or dock over which vehicles travel, a barrier or other warning device shall be placed to prevent workmen from stepping into moving traffic.

(7) *Air requirements*. Ventilation shall be provided to supply adequate fresh healthful air to rooms, buildings, and work areas.

(8) *Vats and tanks*. All open vats and tanks into which workmen could fall shall be guarded.

(9) *Lighting*—(i) *Adequacy*. Illumination shall be provided and designed to supply adequate general and local lighting to rooms, buildings, and work areas during the time of use.

(ii) *Effectiveness*. Factors upon which the adequacy and effectiveness of illumination will be judged, include the following:

(*a*) The quantity of light in footcandle intensity shall be sufficient for the work being done.

(*b*) The quality of the light shall be such that it is free from glare, and has correct direction, diffusion, and distribution.

(*c*) Shadows and extreme contrasts shall be avoided or kept to a minimum.

(10) *Ladders*. Ladders shall be installed and maintained as specified in §§ 1910.25, 1910.26, and 1910.27.

(11) *Hazard marking*. Physical hazard marking shall be as specified in § 1910.144 of this part.

(12) *Electrical wiring and equipment*. (i) All electrical equipment should be installed and maintained in accordance with requirements specified in Subpart S of this part.

(ii) *Repairs*. Electrical repairs shall be made only by authorized and qualified personnel.

(iii) *Identification*. Marks of identification on electriacl equipment shall be clearly visible.

(iv) *Protective equipment*. Rubber protective equipment shall be provided as required by § 1910.137.

(v) *Open switches*. Before working on electrical equipment, switches shall be open and shall be tagged, blocked, or locked out.

(vi) *Concealed conductors*. Where electrical conductors are known to be concealed, no work shall be performed until such conductors are located.

(vii) *Overload relays*. Overload relays shall be reset by authorized qualified personnel only.

(viii) *Passageways to panels*. Passageways to switch centers or panels shall at all times be kept free from obstruction. Not less than 3 feet of clear space shall be maintained in front of switch centers or panels at all times.

(ix) *Bridging fuses*. Doubling or bridging fuses shall be prohibited.

(13) *Hydraulic systems*. Means shall be provided to block, chain, or otherwise secure equipment normally supported by hydraulic pressure so as to provide for safe maintenance.

(14) *Liquefied petroleum gas storage and handling*. Storage and handling of liquified petroleum gas shall be in accordance with the requirements of § 1910.110.

(15) *Gas piping and appliances*. All gas piping and appliances shall be installed in accordance with the American National Standard Requirements for the Installation of Gas Appliances and Gas Piping Z21.30—1964.

(16) *Flammable liquids*. Flammable liquids shall be stored and handled in accordance with § 1910.106.

(17) *Storage, handling, and use of chemicals*—(i) *Threshold limits*. Employees shall not be exposed to airborne concentration of toxic dusts, fumes, vapors, mists or gases that exceed the threshold limit values set forth by § 1910.93.

(ii) *Protective equipment*. The use of chemicals shall be controlled so as to protect employees from harmful exposure to toxic materials. Where necessary, employees shall be provided with and required to wear such protective equipment as will afford adequate protection against harmful exposure as required by Subpart I of this part.

(iii) *Open surface tank operations*. Open surface tank operations shall conform to the requirements of § 1910.94(d).

(18) *Conveyors*—(i) *Standards*. Construction, operation, and maintenance of conveyors shall be in accordance with American National Standard B20.1—1957.

(ii) *Guarding*. Spiked live rolls shall be guarded.

(19) *Stationary tramways and trestles*—(i) *Foundations and walkways*. Tramways and trestles shall have substantial mud sills or foundations which shall be frequently inspected and kept in repair. When vehicles are operated on tramways and trestles which are used for foot passage, traffic shall be controlled or a walkway with standard handrails at the outer edge and shear timber on the inner edge shall be provided. This walkway shall be wide enough to allow adequate clearance to vehicles. When walkways cross over other thoroughfares, they shall be solidly fenced at the outer edge to a height of 42 inches over such thoroughfares.

(ii) *Clearance*. Stationary tramways and trestles shall have a verticle clearance of 22 feet over railroad rails. When constructed over carrier docks or roads, they shall have a clearance of 6 feet above the driver's foot rest on the carrier, and in no event shall this clearance be less than 12 feet from the roadway. In existing operations where it is impractical to obtain such clearance, telltales, electric signals, signs or other precautionary measures shall be installed.

(20) *Blower, collecting, and exhaust systems*—(i) *Design, construction, and maintenance*. Blower collecting, and exhaust systems should be designed, constructed, and maintained in accordance with American National Standards Z33.-1—1961 (For the Installation of Blower and Exhaust Systems for Dust, Stock, and Vapor Removal or Conveying) and Z12.2—1962 (R1969) (Code for the Prevention of Dust Explosion in Woodworking and Wood Flour Manufacturing Plants).

(ii) *Collecting systems*. All mills containing one or more machines that create dust, shavings, chips, or slivers during a period of time equal to or greater than one-fourth of the working day, shall be equipped with a collecting system. It may be either continuous or automatic, and shall be of sufficient strength and capacity to enable it to remove such refuse from points of operation and immediate vicinities of machines and work areas.

(iii) *Exhaust or conveyor systems*. Each woodworking machine that creates dust, shavings, chips, or slivers shall be equipped with an exhaust or conveyor system located and adjusted to remove the maximum amount of refuse from the point of operation and immediate vicinity.

(iv) *Exhaust pipes.* Exhaust pipes shall be of such construction and internal dimensions as to minimize the possibility of clogging. They should be accessible for cleaning.

(v) *Dust chambers.* Exhaust pipes shall not discharge into an unconfined outside pile if uncontrolled fire or explosion hazards are created. They may empty into settling or dust chambers, designed to prevent the dust or refuse from entering any work area. Such chambers shall be constructed and operated to minimize the danger of fire or dust explosion.

(vi) *Hand removal of refuse.* Provision for the daily removal of refuse shall be made in all operations not required to have an exhaust system or having refuse too heavy, bulky, or otherwise unsuitable to be handled by the exhaust system.

(21) *Chippers*—(i) *Whole-log chippers.* The feed system to the chipper shall be arranged so the operator does not stand in direct line with the chipper spout (hopper). The chipper spout shall be enclosed to a height of not less than 36 inches from the floor or the operator's platform. A safety belt and lifeline shall be worn by workmen when working at or near the spout unless the spout is guarded. The lifeline shall be short enough to prevent workers from falling into the chipper.

(ii) *Hogs.* (*a*) Hog mills shall be so designed and arranged that from no position on the rim of the chute shall the distance to the cutter knives be less than 40 inches.

(*b*) Hog feed chutes shall be provided with suitable and approved baffles, which shall minimize material from being thrown from the mill.

(*c*) Employees feeding hog mills shall be provided with safety belts and lines unless guarded.

(22) *Mechanical power-transmission apparatus.* The construction, operation, and maintenance of all mechanical power-transmission apparatus shall be in accordance with the requirements of § 1910.219.

(23) *Bins, bunkers, hoppers, and fuel houses*—(i) *Guarding.* Open bins, bunkers, and hoppers whose upper edges extend less than 3 feet above working level shall be equipped with standard handrails and toe boards, or have their tops covered by a substantial grill or grating with openings small enough to prevent a man from falling through.

(ii) *Use of wheeled equipment to load bins.* Where automotive or other wheeled equipment is used to move materials into bins, bunkers, and hoppers, adequate guard rails shall be installed along each side of the runway, and a substantial bumper stop provided when necessary.

(iii) *Exits, lighting, and safety devices.* Fuel houses and bins shall have adequate exits and lighting, and all necessary safety devices shall be provided and shall be used by persons entering these structures.

(iv) *Walkways.* Where needed, fuel houses and bins shall have a standard railed platform or walkway near the top.

(24) *Ropes, cables, slings, and chains*—(i) *Safe Usage.* Ropes, cables, slings, and chains shall be used in accordance with safe use practices recommended by the manufacturer or within safe limits recommended by the equipment manufacturer when used in conjunction with it.

(ii) *Hooks.* No open hook shall be used in rigging to lift any load where there is hazard from relieving the tension on the hook from the load or hook catching or fouling.

(iii) *Work by qualified persons.* Installation, inspection, maintenance, repair, and testing of ropes, cables, slings, and chains shall be done only by persons qualified to do such work.

(iv) *Slings.* (*a*) Slings and their fittings and fastenings, when in use, shall be inspected daily for evidence of overloading, excessive wear, or damage. Slings found to be defective shall be removed from service.

(*b*) Proper storage shall be provided for slings while not in use.

(*c*) Suitable protection shall be provided between the sling and sharp unyielding surfaces of the load to be lifted.

(v) *Ropes or cables.* (*a*) Wire rope or cable shall be inspected when installed and once each week thereafter, when in use. It shall be removed from hoisting or load-carrying service when kinked or when one of the following conditions exists:

(*1*) When three broken wires are found in one lay of 6 by 6 wire rope.

(*2*) When six broken wires are found in one lay of 6 by 19 wire rope.

(*3*) When nine broken wires are found in one lay of 6 by 37 wire rope.

(*4*) When eight broken wires are found in one lay of 8 by 19 wire rope.

(*5*) When marked corrosion appears.

(*6*) Wire rope of a type not described herein shall be removed from service when 4 percent of the total number of wires composing such rope are found to be broken in one lay.

(*b*) Wire rope removed from service due to defects shall be plainly marked or identified as being unfit for further use on cranes, hoists, and other load-carrying devices.

(*c*) The ratio between the rope diameter and the drum, block, sheave, or pulley tread diameter shall be such that the rope will adjust itself to the bend without exsessive wear, deformation, or injury. In no case shall the safe value of drums, blocks, sheaves, or pulleys be reduced when replacing such items unless compensating changes are made for rope used and for safe loading limits.

(vi) *Drums, sheaves, and pulleys.* Drums, sheaves, and pulleys shall be smooth and free from surface defects liable to injure rope. Drums, sheaves, or pulleys having eccentric bores or cracked hubs, spokes, or flanges shall be removed from service.

(vii) *Connections.* Connections, fittings, fastenings, and other parts used in connection with ropes and cables shall be of good quality and of proper size and strength, and shall be installed in accordance with the manufacturer's recommendations.

(viii) *Socketing, splicing, and seizing.* (*a*) Socketing, splicing, and seizing of cables shall be performed only by qualified persons.

(*b*) All eye splices shall be made in an approved manner and wire rope thimbles of proper size shall be fitted in the eye, except that in slings the use of thimbles shall be optional.

(*c*) Wire rope clips attached with U-bolts shall have these bolts on the dead or short end of the rope. The U-bolt nuts shall be retightened immediately after initial load carrying use and at frequent intervals thereafter.

(*d*) When a wedge socket-type fastening is used, the dead or short end of the cable shall be clipped with a U-bolt or otherwise made secure against loosening.

(*e*) *Fittings.* Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged shall be removed from service.

(*f*) *Running lines.* Running lines of hoisting equipment located within 6 feet 6 inches of the ground or working level shall be boxed off or otherwise guarded, or the operating area shall be restricted.

(*g*) *Number of wraps on drum.* There shall be not less than two full wraps of hoisting cable on the drum of cranes and hoists at all times of operation.

(*h*) *Drum flanges.* Drums shall have a flange at each end to prevent the cable from slipping off.

(*i*) *Sheave guards.* Bottom sheaves shall be protected by close fitting guards to prevent cable from jumping the sheave.

(*j*) *Preventing abrasion.* The reeving of a rope shall be so arranged as to minimize chafing or abrading while in use.

(ix) *Chains.* (*a*) Chains used in load carrying service shall be inspected before initial use and weekly thereafter.

(*b*) Chain shall be normalized or annealed periodically as recommended by the manufacturer.

(*c*) If at any time any 3-foot length of chain is found to have stretched one-third the length of a link it shall be discarded.

(*d*) Bolts or nails shall not be placed between two links to shorten or join chains.

(*e*) Broken chains shall not be spliced by inserting a bolt between two links with the head of the bolt and nut sustaining the load, or by passing one link through another and inserting a bolt or nail to hold it.

(x) *Fiber rope.* (*a*) Frozen fiber rope shall not be used in load carrying service.

(*b*) Fiber rope that has been subjected to acid or excessive heat shall not be used for load carrying purposes.

(*c*) Fiber rope shall be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

(25) Reserved.

(26) *Mechanical stackers and unstackers*—(i) *Power-transmission apparatus.* Stackers and unstackers, shall have all gears, sprockets, chains, belt drives, and other power transmission apparatus guarded as specified in § 1910.219.

(ii) *Lumber lifting devices.* Lumber lifting devices on all stackers shall be designed and arranged so as to minimize the possibility of lumber falling from such devices.

(iii) *Blocking hoisting platform.* Means shall be provided to positively block the hoisting platform when employees must go beneath the stacker or unstacker hoist.

(iv) *Identifying controls.* Every manually operated control switch shall be properly identified and so located as to be readily accessible to the operator.

(v) *Locking main control switches.* Main control switches shall be so designed that they can be locked in the open position.

(vi) *Guarding side openings.* The hoistway side openings at the top level of the stacker and unstacker shall be protected by enclosures of standard railings.

(vii) *Guarding hoistway openings.* When the hoist platform or top of the load is below the working platform, the hoistway openings shall be guarded.

(viii) *Guarding lower landing area.* The lower landing area of stackers and unstackers shall be guarded by enclosures that prevent entrance to the area or pit below the hoist platform. Entrances should be protected by electrically interlocked gates which, when open, will disconnect the power and set the hoist brakes. When the interlock is not installed, other positive means of protecting the entrance shall be provided.

(ix) *Inspection.* Every stacker and unstacker shall be inspected at frequent intervals and all defective parts shall be immediately repaired or replaced.

(x) *Cleaning pits.* Safe means of entrance and exit shall be provided to permit cleaning of pits.

(xi) *Preventing entry to hazardous area.* Where the return of trucks from unstacker to stacker is by mechanical power or gravity, adequate signs, warning devices, or barriers shall be erected to prevent entry into the hazardous area.

(27) *Lumber piling and storage*—(i) *Pile foundations.* In stacking units of lumber, pile foundations shall be designed and arranged to support maximum loads without sinking, sagging, or permitting the piles to topple. In unit package piles, substantial bolsters or unit separators shall be placed between each package directly over the stickers.

(ii) *Stacking dissimilar unit packages.* Long units of lumber shall not be stacked upon shorter packages except where a stable pile can be made with the use of package separators.

(iii) *Unstable piles.* Piles of lumber which have become unstable shall be immediately made safe, or the area into which they might fall shall be fenced or barricaded and employees prohibited from entering it.

(iv) *Stickers.* Unit packages of lumber shall be provided with stickers as necessary to insure stability under ordinary operating conditions.

(v) *Sticker alignment.* Stickers shall extend the full width of the package, shall be uniformly spaced, and shall be aligned one above the other. Stickers may be lapped with a minimum overlapping of 12 inches. Stickers shall not protrude more than 2 inches beyond the sides of the package.

(vi) *Pile height.* The height of unit package piles shall be dependent on the dimensions of the packages and shall be such as to provide stability under normal operating conditions. Adjacent lumber piles may be tied together with separators to increase stability.

(28) *Lumber loading.* Loads shall be built and secured to insure stability in transit.

(29) *Burners*—(i) *Guying.* If the burner stack is not self-supporting, it shall be guyed or otherwise supported.

(ii) *Runway.* The conveyor runway to the burner shall be equipped with a standard handrail. If the runway crosses a roadway or thoroughfare, standard toe boards shall be provided in addition.

(30) *Vehicles*—(i) *Scope.* Vehicles shall include all mobile equipment normally used in sawmill, planing mill, storage, shipping, and yard operations.

(ii) *Warning signals and spark arrestors.* All vehicles shall be equipped with audible warning signals and where practicable shall have spark arrestors.

(iii) *Lights.* All vehicles operated in the dark or in poorly lighted areas shall be equipped with head and tail lights.

(iv) *Overhead guard.* All vehicles operated in areas where overhead hazards exist shall be equipped with an approved overhead guard. See American National Standard Safety Code for Powered Industrial Trucks, B56.1—1969.

(v) *Platform guard.* Where the operator is exposed to hazard from backing the vehicle into objects, an approved platform guard shall be provided and so arranged as to not impede exit of driver from vehicle.

(vi) *Exposed parts.* Vehicle flywheels, gears, sprockets, chains, shear points, and other exposed parts constituting a hazard to the operator or other persons shall be guarded in accordance with the requirements of § 1910.219.

(vii) *Operation in buildings.* Vehicles powered by internal combustion engines shall not operate in buildings unless the buildings are adequately ventilated.

(viii) *Load limits.* No vehicle shall be operated with loads exceeding its safe load capacity.

(ix) *Brakes.* All vehicles shall be equipped with brakes capable of holding and controlling the vehicle and capacity load upon any incline or grade over which they may be operated.

(x) *Lift trucks.* Lift trucks shall be designed, constructed, maintained, and operated in accordance with the requirements of § 1910.178.

(xi) *Carriers.* (*a*) Carriers shall be so designed and constructed that the operator's field of vision shall not be unnecessarily restricted.

(*b*) Carriers shall be provided with an access ladder or equivalent.

(xii) *Lumber hauling trucks.* (*a*) On trucks where movement of load on stopping would endanger the operator, a substantial bulkhead shall be installed behind the operator's seat. This shall extend to the top of the operator's compartment.

(*b*) Stakes, stake pockets, racks, tighteners, and binders shall provide adequate means to secure the load against any movement during transit.

(*c*) Where rollers are used, at least two shall be equipped with locks which shall be locked when supporting loads during transit.

(31) *Traffic control and flow*—(i) *Hazardous crossings.* Railroad tracks and other hazardous crossings shall be plainly posted and appropriate traffic control devices (American National Standard D8.1—1967 for Railroad-Highway Grade Crossing Protection) should be utilized.

(ii) *Restricted overhead clearance.* All areas of restricted side or overhead clearance shall be plainly marked.

(iii) *Pickup and unloading points.* Pickup and unloading points and paths for lumber packages on conveyors and transfers and other areas where accurate spotting is required, shall be plainly marked and wheel stops provided where necessary.

(iv) *Aisles, passageways, and roadways.* Aisles, passageways, and roadways shall be sufficiently wide to provide safe side clearance. One-way aisles may be used for two-way traffic if suitable turnouts are provided.

(d) *Log handling, sorting, and storage*—(1) *Log unloading methods, equipment, and facilities*—(i) *Unloading methods.* (*a*) Stakes and chocks which trip shall be constructed in such manner that the tripping mechanism that releases the stake or chocks is activated at the opposite side of the load being tripped.

(*b*) Binders on logs shall not be released prior to securing with unloading lines or other unloading device.

(*c*) Binders shall be released only from the side on which the unloader operates, except when released by remote control devices or except when person making release is protected by racks or stanchions or other equivalent means.

(*d*) Loads on which a binder is fouled by the unloading machine shall have an extra binder or metal band of equal strength placed around the load, or the load shall be otherwise secured so the fouled binder can be safely removed.

(ii) *Unloading equipment and facilities.* (*a*) Machines used for hoisting, unloading, or lowering logs shall be equipped with brakes capable of controlling or holding the maximum load in midair.

(*b*) The lifting cylinders of all hydraulically operated log handling machines shall be equipped with a positive device for preventing the uncontrolled lowering of the load or forks in case of a failure in the hydraulic system.

(*c*) A limit switch shall be installed on powered log handling machines to prevent the lift arms from traveling too far in the event the control switch is not released in time.

(*d*) When forklift-type machines are used to load trailers, a means of securing the loading attachment to the fork shall be installed and used.

(*e*) A-frames and similar log unloading devices shall have adequate height to provide safe clearance for swinging loads and to provide for adequate crotch lines and spreader bar devices.

(*f*) Log handling machines used to stack logs or lift loads above operator's head shall be equipped with adequate overhead protection.

(*g*) All mobile log handling machines shall be equipped with headlights and backup lights.

(*h*) Unloading devices shall be equipped with a horn or other plainly audible signaling device.

(*i*) Movement of unloading equipment shall be coordinated by audible or hand signals when operator's vision is impaired or operating in the vicinity of other employees.

(*j*) Wood pike poles shall be made of straight-grained, select material. Metal or conductive pike poles shall not be used around exposed energized electrical conductors. Defective, blunt, or dull pike poles shall not be used.

(2) *Log unloading and storage areas*—(i) *General*. (*a*) Log dumps, booms, ponds, or storage areas used at night shall be illuminated in accordance with the requirements of American National Standard A11.1—1965 (R–1970) Standard Practice for Industrial Lighting.

(*b*) Log unloading areas shall be arranged and maintained to provide a safe working area.

(*c*) Where skids are used, space adequate to clear a man's body shall be maintained between the top of the skids and the ground.

(*d*) Signs prohibiting unauthorized foot or vehicle traffic in log unloading and storage areas shall be posted.

(ii) *Water log dumps*. (*a*) Ungrounded electrically powered hoists using handheld remote control in grounded locations, such as log dumps or mill log lifts, shall be actuated by circuits operating at less than 50 volts to ground.

(*b*) Roadbeds at log dumps shall be of sufficient width and evenness to insure safe operation of equipment.

(*c*) An adequate brow log or skid timbers or the equivalent shall be provided where necessary. Railroad-type dumps, when located where logs are dumped directly into water or where entire loads are lifted from vehicle, may be exempted providing such practice does not create a hazardous exposure of personnel or equipment.

(*d*) Unloading lines shall be arranged so that it is not necessary for the employees to attach them from the pond or dump side of the load except when entire loads are lifted from the log-transporting vehicle.

(*e*) Unloading lines, crotch lines, or equally effective means shall be arranged and used in a manner to minimize the possibility of any log from swinging or rolling back.

(*f*) When logs are unloaded with peavys or similar manual methods, means shall be provided and used that will minimize the danger from rolling or swinging logs.

(*g*) Guardrails, walkways, and standard handrails shall be installed

(*h*) Approved life rings (see: 46 CFR 160.099 and 46 CFR 160.050) with line attached and maintained to retain buoyancy shall be provided.

(iii) *Log booms and ponds*. (*a*) Walkways and floats shall be installed and securely anchored to provide adequate passageway for employees.

(*b*) All regular boom sticks and foot logs shall be reasonably straight, with no protruding knots and bark, and shall be capable of supporting, above the water line at either end, the weight of an employee and equipment.

(*c*) Permanent cable swifters shall be so arranged that it will not be necessary to roll boom sticks in order to attach or detach them.

(*d*) Periodic inspection of cable or dogging lines shall be made to determine when repair or removal from service is necessary.

(*e*) The banks of the log pond in the vicinity of the log haul shall be reinforced to prevent caving in.

(*f*) Artificial log ponds shall be drained, cleaned, and refilled when unhealthy stagnation or pollution occurs.

(*g*) Employees whose duties require them to work from boats, floating logs, boom sticks, or walkways along or on water shall be provided with and shall wear appropriate buoyant devices while performing such duties.

(*h*) Stiff booms shall be two float logs wide secured by boom chains or other connecting devices, and of a width adequate for the working needs. Walking surfaces shall be free of loose material and maintained in good repair.

(*i*) Boom sticks shall be fastened together with adequate crossties or couplings.

(*j*) Floating donkeys or other power-driven machinery used on booms shall be placed on a raft or float with enough buoyancy to keep the deck well above water.

(*k*) All sorting gaps shall have a substantial stiff boom on each side.

(iv) *Pond boats and rafts*. The applicable provisions of the Standard for Fire Protection for Motorcraft, NFPA No. 302—1968, shall be complied with.

(*a*) Decks of pond boats shall be covered with nonslip material.

(*b*) Powered pond boats or rafts shall be provided with at least one approved fire extinguisher, and one lifering with line attached.

(*c*) Boat fuel shall be transported and stored in approved safety containers (Underwriters Laboratories, Inc.).

(*d*) Inspection, maintenance, and ventilation of the bilge area shall be provided to prevent accumulation of highly combustible materials.

(*e*) Adequate ventilation shall be provided for the cabin area on enclosed cabin-type boats to prevent accumulation of harmful gases or vapors.

(v) *Dry deck storage*. (*a*) Dry deck storage areas shall be kept orderly and shall be maintained in a condition which is conducive to safe operation of mobile equipment.

(*b*) Logs shall be stored in a safe and orderly manner, and roadways and traffic lanes shall be maintained at a width adequate for safe travel of log handling equipment.

(*c*) Logs shall be arranged to minimize the chance of accidentally rolling from the deck.

(vi) *Log hauls and slips*. (*a*) Walkways along log hauls shall have a standard handrail on the outer edge, and cleats or other means to assure adequate footing and enable employees to walk clear of the log chute.

(*b*) Log haul bull chains or cable shall be designed, installed, and maintained to provide adequate safety for the work need.

(*c*) Log haul gear and bull chain drive mechanism shall be guarded.

(*d*) Substantial troughs for the return strand of log haul chains shall be provided over passageways.

(*e*) Log haul controls shall be located and identified to operate from a position where the operator will, at all times, be in the clear of logs, machinery, lines, and rigging. In operations where control is by lever exposed to incoming logs, the lever shall be arranged to operate the log haul only when moved toward the log slip or toward the log pond.

(*f*) A positive stop shall be installed on all log hauls to prevent logs from traveling too far ahead in the mill.

(*g*) Overhead protection shall be provided for employees working below logs being moved to the log deck.

(*h*) Log wells shall be provided with safeguards to minimize the possibility of logs rolling back into well from log deck.

(3) *Log decks*—(i) *Access*. Safe access to the head rig shall be provided.

(ii) *Stops*. Log decks shall be provided with adequate stops, chains, or other safeguards to prevent logs from rolling down the deck onto the carriage or its runway.

(iii) *Barricade*. A barricade or other positive stop of sufficient strength to stop any log shall be erected between the sawyer's stand and the log deck.

(iv) *Loose chains*. Loose chains from overhead canting devices or other equipment shall not be allowed to hang over the log deck in such manner as to strike employees.

(v) *Swing saws*. Swing saws on log decks shall be equipped with a barricade and stops for protection of employees who may be on the opposite side of the log haul chute.

(vi) *Drag saws*. Where reciprocating log cutoff saws (drag saws) are provided, they shall not project into walkway or aisle.

(vii) *Circular cutoff saws*. Circular log bucking or cutoff saws shall be so located and guarded as to allow safe entrance to and exit from the building.

(viii) *Entrance doorway*. Where the cutoff saw partially blocks the entrance from the log haul runway, the entrance shall be guarded.

(4) *Mechanical barkers*—(i) *Rotary barkers.* Rotary barking devices shall be so guarded as to protect employees from flying chips, bark, or other extraneous material.

(ii) *Elevating ramp.* If an elevating ramp or gate is used, it shall be provided with a safety chain, hook, or other means of suspension while employees are underneath.

(iii) *Area around barkers.* The hazardous area around ring barkers and their conveyors shall be fenced off or posted as a prohibited area for unauthorized persons.

(iv) *Enclosing hydraulic barkers.* Hydraulic barkers shall be enclosed with strong baffles at the inlet and outlet. The operator shall be protected by adequate safety glass or equivalent.

(v) *Holddown rolls.* Holddown rolls shall be installed at the infeed and outfeed sections of mechanical ring barkers to control the movement of logs.

(e) *Log breakdown and related machinery and facilities*—(1) *Log carriages and carriage runways*—(i) *Bumpers.* A substantial stop or bumper with adequate shock-absorptive qualities shall be installed at each end of the carriage runway.

(ii) *Footing.* Rider-type carriages shall be floored to provide secure footing and a firm working platform for the block setter.

(iii) *Sheave housing.* Sheaves on rope-driven carriages shall be guarded at floor line with substantial housings.

(iv) *Carriage control.* A positive means shall be provided to prevent unintended movement of the carriage. This may involve a control locking device, a carriage tie-down, or both.

(v) *Barriers and warning signs.* A barrier shall be provided to prevent employees from entering the space necessary for travel of the carriage, with headblocks fully receded, for the full length and extreme ends of carriage runways. Warning signs shall be posted at possible entry points to this area.

(vi) *Overhead clearance.* For a rider-type carriage adequate overhead clear space above the carriage deck shall be provided for the full carriage runway length.

(vii) *Sweeping devices.* Carriage track sweeping devices shall be used to keep track rails clear of debris.

(viii) *Dogs.* Dogging devices shall be adequate to secure logs, cants, or boards, during sawing operations.

(2) *Head saws*—(i) *Band head saws.* (*a*) Band head saws shall not be operated at speeds in excess of those recommended by the manufacturer.

(*b*) Band head saws shall be thoroughly inspected for cracks, splits, broken teeth, and other defects. A bandsaw with a crack greater than one-tenth the width of the saw shall not be placed in service until width of saw is reduced to eliminate crack, until cracked section is removed, or crack development is stopped.

(*c*) Provisions shall be made for alerting and warning employees before starting band head saws, and measures shall be taken to insure that all persons are in the clear.

(ii) *Bandsaw wheels.* (*a*) No bandsaw wheel shall be run at a peripheral speed in excess of that recommended by the manufacturer. The manufacturer's recommended maximum speed shall be stamped in plainly legible figures on some portion of the wheel.

(*b*) Band head saw wheels shall be subjected to monthly inspections. Hubs, spokes, rims, bolts, and rivets shall be thoroughly examined in the course of such inspections. A loose or damaged hub, a rim crack, or loose spokes shall make the wheel unfit for service.

(*c*) Band wheels shall be completely encased or guarded, except for a portion of the upper wheel immediately around the point where the blade leaves the wheel, to permit operator to observe movement of equipment. Necessary ventilating and observation ports may be permitted. Substantial doors or gates are allowed for repair, lubrication, and saw changes; such doors or gates shall be closed securely during operation. Band head rigs shall be equipped with a saw catcher or guard of substantial construction.

(iii) *Single circular head saws.* (*a*) Circular head saws shall not be operated at speeds in excess of those specified by the manufacturer. Maximum speed shall be etched on the saw.

(*b*) Circular head saws shall be equipped with safety guides which can be readily adjusted without use of hand tools.

(*c*) The upper saw of a double circular mill shall be provided with a substantial hood or guard. A screen or other suitable device shall be placed so as to protect the sawyer from flying particles.

(*d*) All circular sawmills where live rolls are not used behind the head saw shall be equipped with a spreader wheel or splitter.

(iv) *Twin circular head saws.* Twin circular head saw rigs such as scrag saws shall meet the specifications for single circular head saws in subdivision (iii) of this subparagraph where applicable.

(v) *Whole-log sash gang saws (Swedish Gangs).* (*a*) Cranks, pitman rods, and other moving parts shall be adequately guarded.

(*b*) Feed rolls shall be enclosed by a cover over the top, front, and open ends except where guarded by location. Drive mechanism to feed rolls shall be enclosed.

(*c*) Carriage cradles of whole-log sash gang saws (Swedish gangs), shall be of adequate height to prevent logs from kicking out while being loaded.

(3) *Resaws*—(i) *Band resaws.* Band resaws shall meet the specifications for band head saws as required by subparagraph (2)(i) of this paragraph.

(ii) *Circular gang resaws.* (*a*) Banks of circular gang resaws shall be guarded by a hood.

(*b*) Circular gang resaws shall be provided with safety fingers or other antikickback devices.

(*c*) Circular gang resaws shall not be operated at speeds exceeding those recommended by the manufacturer.

(*d*) Feed belts and drive pulleys shall be guarded in accordance with the requirements of § 1910.219.

(*e*) Feed rolls shall be guarded.

(*f*) Each circular gang resaw, except self-feed saws with a live roll or wheel at back of saw, shall be provided with spreaders.

(iii) *Sash gang resaws.* Sash gang resaws shall meet the safety specifications of whole-log sash gang saws in accordance with the requirements of subparagraph (2)(v) of this paragraph.

(4) *Trimmer saws*—(i) *Maximum speed.* Trimmer saws shall not be run at peripheral speeds in excess of those recommended by the manufacturer.

(ii) *Guards.* (*a*) Trimmer saws shall be guarded in front by adequate baffles to protect against flying debris and they shall be securely bolted to a substantial frame. These guards for a series of saws shall be set as close to the top of the trimmer table as is practical.

(*b*) The end saws on trimmers shall be guarded.

(*c*) The rear of trimmer saws shall have a guard the full width of the saws and as much wider as practical.

(iii) *Safety stops.* Automatic trimmer saws shall be provided with safety stops or hangers to prevent saws from dropping on table.

(5) *Edgers*—(i) *Location.* (*a*) Where vertical arbor edger saws are located ahead of the main saw, they shall be so guarded that an employee cannot contact any part of the edger saw from his normal position.

(*b*) Edgers shall not be located in the main roll case behind the head saws.

(ii) *Guards.* (*a*) The top and the openings in end and side frames of edgers shall be adequately guarded and gears and chains shall be fully housed. Guards may be hinged or otherwise arranged to permit oiling and the removal of saws.

(*b*) All edgers shall be equipped with pressure feed rolls.

(*c*) Pressure feed rolls on edgers shall be guarded against accidental contact.

(iii) *Antikickback devices.* (*a*) Edgers shall be provided with safety fingers or other approved methods of preventing kickbacks or guarding against them. A barricade in line with the edger, if properly fenced off, may be used if safety fingers are not feasible to install.

(*b*) A controlling device shall be installed and located so that the operator can stop the feed mechanism without releasing the tension of the pressure rolls.

(iv) *Operating speed of live rolls.* Live rolls and tailing devices in back of edger shall operate at a speed not less than the speed of the edger feed rolls.

(6) *Planers*—(i) *Guards.* (*a*) All cutting heads shall be guarded.

(*b*) Side head hoods shall be of sufficient height to safeguard the head setscrew.

(*c*) Pressure feed rolls and "pineapples" shall be guarded.

(*d*) Levers or controls shall be so arranged or guarded as to reduce the possibility of accidental operation.

(*f*) *Dry kilns and facilities*—(1) *Kiln foundations.* Dry kilns shall be constructed upon solid foundations to prevent tracks from sagging.

(2) *Passageways.* A passageway shall be provided to give adequate clearance on at least one side or in the center of end-piled kilns and on two sides of cross-piled kilns.

(3) *Doors*—(i) *Main kiln doors.* (*a*) Main kiln doors shall be provided with a method of holding them open while kiln is being loaded.

(*b*) Counterweights on vertical lift doors shall be boxed or otherwise guarded.

(*c*) Adequate means shall be provided to firmly secure main doors, when they are disengaged from carriers and hangers, to prevent toppling.

(ii) *Escape doors.* (*a*) If operating procedures require access to kilns, kilns shall be provided with escape doors that operate easily from the inside, swing in the direction of exit, and are located in or near the main door at the end of the passageway.

(*b*) Escape doors shall be of adequate height and width to accommodate an average size man.

(4) *Pits.* Pits shall be well ventilated, drained, and lighted, and shall be large enough to safely accommodate the kiln operator together with operating devices such as valves, dampers, damper rods, and traps.

(5) *Steam mains.* All high-pressure steam mains located in or adjacent to an operating pit shall be covered with heat-insulating material.

(6) *Ladders.* A fixed ladder, in accordance with the requirements of § 1910.27 or other adequate means shall be provided to permit access to the roof. Where controls and machinery are mounted on the roof, a permanent stairway with standard handrail shall be installed in accordance with the requirements of § 1910.24.

(7) *Chocks.* A means shall be provided for chocking or blocking cars.

(8) *Kiln tender room.* A warm room shall be provided for kiln employees to stay in during cold weather after leaving a hot kiln.

(9) *Mechanical equipment.* All belts, pulleys, blowers, and other exposed moving equipment used in or about kilns shall be guarded in accordance with the requirements of § 1910.219.

(g) *Personal protective equipment.* The requirements for personal protective equipment specified in subpart I shall be complied with.

(h) *Sanitation requirements.* The requirements of § 1910.141 shall govern sanitation practices.

(i) *Fire protection.* The requirements of Subpart L of this part shall be complied with in providing the necessary fire protection for sawmills.

(j) *Effective dates.* (1) The provisions of this § 1910.265 shall become effective on August 27, 1971, except as provided in the remaining subparagraphs of this paragraph.

(2) The following provisions shall become effective on February 15, 1972:

§ 1910.265 (c) (12), (e) (15), and (c) (30) (iv).

(3) Notwithstanding subparagraph (1), (2), or (4) of this paragraph, any provision in any other paragraph of this section which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(4) Notwithstanding anything in subparagraph (1) of this paragraph, if any standard in 41 CFR Part 50–204, other than a national consensus standard incorporated by reference in § 50–204.2 (a) (1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this § 1910.265 which is derived from 41 CFR Part 50–204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.266 Pulpwood logging.

(a) *Application*—(1) *General.* This section applies to pulpwood logging operations including but not limited to the operations of felling, limbing, marking, bucking, loading, skidding, prehauling and other operations associated with the preparation and movement of pulpwood timber from the stump to the point of delivery. The provisions of this section do not apply to logging operations relating to sawlogs, veneer bolts, poles, piling and other forest products.

(2) *Standards incorporated by reference.* Standards covering issues of occupational safety and health which are of general application without regard to any specific industry are incorporated by reference in paragraphs of this section and made applicable to pulpwood logging. All such standards shall be construed according to the rules of construction set out in § 1910.05.

(b) *Definitions applicable to this section*—(1) *Arch.* The term "arch" means an extension to rear section of a vehicle used in skidding used to raise the forward part of a load clear of the ground.

(2) *Back cut (felling cut).* The term "back cut" means the final cut in a felling operation made on the opposite side from the undercut.

(3) *Backfill.* The term "backfill" means excavated material used to build up a road higher than the original level.

(4) *Ballistic nylon.* The term "ballistic nylon" means a fabric of high tensile properties designed to provide protection from lacerations.

(5) *Borrow.* The term "borrow" means road construction material which is taken to another location for use. The source area is called "borrow pit."

(6) *Buck.* The term "buck" means the process of severing a tree into sections (logs or bolts).

(7) *Choker.* The term "choker" means a length of wire rope or chain with a loop or noose at one end used to secure trees or sections of trees for skidding.

(8) *Debark.* The term "debark" means the action of removing bark from trees or sections of trees. Debark generally denotes mechanical means as opposed to manual peeling. Synonyms are "bark" and "barking".

(9) *Fairlead.* The term "fairlead" means an arrangement of horizontal, and sometimes vertical, rollers usually mounted at the end of an arch to allow free play of wire rope during winching.

(10) *Fell.* The term "fell" means the process of severing a tree from the stump so that it drops to the ground. Note that "fell" and "feller" are used in this standard. The terms "fall" and "faller" are commonly used in the Western United States and they have the same meaning as "fell" and "feller".

(11) *Grade (see slope).* The term "grade" means the slope of a surface such as a roadway. Also, the elevation of a real or planned surface or structure.

(12) *Guarded.* The term "guarded" means protected by a cover, shield, rail, or other device, or by location, so as to reduce the probability of injury.

(13) *Guyline.* The term "guyline" means a line used to stay or support spar trees, booms, etc.

(14) *Landing.* The term "landing" means any area where wood is concentrated. It is also called "yard," "deck," "brow."

(15) *Lodged tree.* The term "lodged tree" means a tree that has not fallen to the ground after being partly or wholly separated from its stump or otherwise displaced from its natural position.

(16) *Pickaroon.* The term "pickaroon" means a device with a head similar to an axe but with a point rather than a blade mounted on the end of a handle which is used to assist in the lifting and placement of bolts of wood.

(17) *Prehaul.* The term "prehaul" means the hauling of forest products by off-the-road vehicles, nonhighway transport, or other movement prior to highway or rail movement, where the pulpwood travels clear of the ground. The term "forward" has the same meaning.

(18) *Riprap.* The term "riprap" means rock, metal stripping, or wooden timbers used to contain and stabilize earth embankments and fills.

(19) *Root wad.* The term "root wad" means the ball of roots which extends above ground level when a tree is pushed over by wind or other means.

(20) *Skid.* The term "skid" means the movement of bolts, logs, or trees by pulling or towing across the terrain. It may be accomplished by a stationary machine, a moving vehicle, or animal. The term is also called "yarding". The definitive feature is contact between the terrain and the product during movement.

(21) *Slope (see grade).* The term "slope" is a term of measurement in percent and means the increase in height over the distance measured. An increase of 1 foot over a distance of 5 feet is expressed as a 20 percent slope.

(22) *Snag.* The term "snag" means any dead standing tree or portion thereof remaining standing.

(23) *Spring pole.* The term "spring pole" means a section of tree, sapling, limb, etc. which is, by virtue of its ar-

rangement with relation to other materials, under tension.

(24) *Undercut.* The term "undercut" means a notch cut in a tree to guide the tree in felling.

(25) *Widow maker.* The term "widow maker" means an overhanging limb or section of tree which could become dislodged and drop to the ground (see also "lodged tree").

(26) *Wood hook.* The terms "wood hook" and "pulp hook" mean a device to be held in one hand which is fitted with a pointed section. The device is used to assist in the manual piling and handling of bolts of wood (see Pickaroon).

(c) *General requirements*—(1) *Clothing, personal protective devices, and first aid.*

(i) Gloves shall be provided for use when working with wire rope in any form.

(ii) Safety boots or shoes (excluding low cut shoes) shall be provided in accordance with American National Standard for Men's Safety-Toe Footwear, Z41.1—1967.

(iii) Safety helmets of approved design in accordance with American National Standard for Safety Requirements for Industrial Head Protection, Z89.1—1969 shall be provided.

(iv) Eye or face protection in accordance with American National Standard for Practice for Occupational and Educational Eye and Face Protection, Z87.1—1968 shall be provided for use where chips and sawdust or flying particles are present.

(v) Dust masks in accordance with American National Standard Practices for Respiratory Protection Z88.2—1969 shall be provided for use where conditions warrant.

(vi) Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G–16 of § 1910.95 when measured on the A scale of a standard sound level meter at slow response.

(vii) First aid kits sufficient for the number of employees shall be provided at the work site and on all transport vehicles. In all areas where poisonous snakes may exist, snake bite kits shall be a part of the regular first aid equipment. First aid kits shall be regularly inspected and replenished.

(2) *Handtools.* (i) The employer shall be responsible for the safe condition of tools when furnished by him and user shall inspect tool to assure safe condition.

(ii) Handles shall be sound, straight and tight fitting.

(iii) Driven tools shall be dressed to remove any mushrooming.

(iv) Cutting tools shall be kept sharp and properly shaped.

(v) Wood hooks and pickaroons of good grade steel shall be used.

(vi) Tools shall be used for purposes for which they were designed.

(vii) Hands tools shall be sheathed or boxed if transported in a vehicle with personnel. If not contained in a box, the sheathed tools shall be fastened to the vehicle.

(viii) Proper storage facilities shall be provided for hand tools. Tools shall be stored in the provided location at all times when not in use.

(ix) Periodic inspections shall be made to assure all tools are serviceable and others removed from use.

(3) *Environmental conditions.* (i) All work shall terminate and employees moved to a place of safety during electrical storms and periods of high winds or other unusual weather conditions are dangerous to personnel.

(ii) Dead, broken, or rotted limbs or trees that are a hazard (widow makers) shall be felled or otherwise removed before commencing logging operations, building roads, trails or landing, in their vicinity.

(4) *Work areas.* (i) All persons shall be instructed to work within the vocal range of other workmen unless a procedure has been established for periodically checking their location and welfare.

(ii) All men shall be accounted for at the end of each work day.

(iii) An approved (Underwriters Laboratories or Factory Mutual Engineering Corp.) fire extinguisher shall be provided at locations where machines are operating and/or on each vehicle.

(iv) Fuel shall be stored only in approved (Underwriters Laboratories or Factory Mutual Engineering Corp.) well-marked containers located for safe access for fueling vehicles and equipment and at a safe distance from all fire hazards.

(5) *Chain saw operations.* (i) Chain saw operators shall be instructed to daily inspect the saws daily to assure that all handles and guards are in place and tight, that all controls function properly, and that the muffler is operative.

(ii) Chain saw operators shall be instructed to follow manufacturer's instructions as to operation and adjustment.

(iii) Chain saw operators shall be instructed to fuel the saw only in safe areas and not under conditions conducive to fire such as near men smoking, hot engine, etc.

(iv) Chain saw operators shall be instructed to hold the saw with both hands during operation.

(v) Chain saw operators shall be instructed to start the saw at least 10 feet away from fueling area.

(vi) Chain saw operators shall be instructed to start the saw only on the ground or when otherwise firmly supported.

(vii) Chain saw operators shall be instructed to be certain of footing and to clear away brush which might interfere before starting to cut.

(viii) Chain saw operators shall be instructed not to use engine fuel for starting fires or as a cleaning solvent.

(ix) Chain saw operators shall be instructed to shut off the saw when carrying it for a distance greater than from tree to tree or in hazardous conditions such as slippery surfaces or heavy underbrush. The saw shall be at idle speed when carried short distances.

(x) Chain saw operators shall be instructed to carry the saw in a manner to prevent contact with the chain and muffler.

(xi) Chain saw operators shall be instructed not to use the saw to cut directly overhead or at a distance that would requre the operator to relinquish a safe grip on the saw.

(6) *Stationary and mobile equipment operation.* (i) Equipment operators shall be instructed as to the manufacturers recommendations for equipment operation, maintenance, safe practices, and site operating procedures.

(ii) Equipment shall be kept free of flammable material.

(iii) Equipment shall be kept free of any material which might contribute to slipping and falling.

(iv) Engine of equipment shall be shut down during fueling, servicing, and repairs except where operation is required for adjustment.

(v) Equipment shall be inspected for evidence of failure or incipient failure.

(vi) The equipment operator shall be instructed to walk completely around machine and assure that no obstacles or personnel are in the area before startup.

(vii) The equipment operator shall be instructed to start and operate equipment only from the operator's station or from safe area recommended by the manufacturer.

(viii) Seat belt shall be provided on mobile equipment.

(ix) The equipment operator shall be instructed to check all controls for proper function and response before starting working cycle.

(x) The equipment operator shall be instructed to ground or secure all movable elements when not in use.

(xi) The equipment operator shall be advised of the load capacity and operating speed of the equipment.

(xii) The equipment operator shall be advised of the stability limitations of the equipment.

(xiii) The equipment operator shall be instructed to maintain adequate distance from other equipment and personnel.

(xiv) Where signalmen are used, the equipment operator shall be instructed to operate the equipment only on signal from the designated signalman and only when signal is distinct and clearly understood.

(xv) The equipment operator shall be instructed not to operate movable elements (boom, grapple, load, etc.) close to or over personnel.

(xvi) The equipment operator shall be instructed to signal his intention before operation when personnel are in or near the working area.

(xvii) The equipment operator shall be instructed to dismount and stand clear for all loading and unloading of his mobile vehicle by other mobile equipment. The dismounted operator shall be visible to loader operator.

(xviii) The equipment operator shall be instructed to operate equipment in a manner that will not place undue shock loads on wire rope.

(xix) The equipment operator shall be instructed not to permit riders or observers on the machine unless approved seating and protection is provided.

(xx) The equipment operator shall be instructed to shut down the engine when the equipment is stopped, apply brake locks and ground moving elements before he dismounts.

(xxi) The equipment operator shall be instructed, when any equipment is transported from one job location to another, to transport it on a vehicle of sufficient rated capacity and the equipment shall be properly secured during transit.

(xxii) When any equipment is being moved or operated in the vicinity of an electric distribution line a minimum clearance of ten feet shall be maintained between the electric distribution line and all elements of the machine.

(7) *Explosives.* Only trained and experienced personnel shall handle or use explosives. Usage shall comply with the requirements of § 1910.109.

(d) *Equipment protective devices—stationary and mobile equipment*—(1) *Operator's manual.* There shall be an operator's manual or operating instructions with each machine. It will describe operation, maintenance, and safe practices.

(2) *Protective canopy.* A protective canopy shall be provided for the operator of mobile equipment. It shall be so constructed as to protect the operator from injury due to falling trees or limbs, saplings or branches which might enter the compartment side areas, and snapping winch lines or other objects.

(i) The canopy shall be of adequate size so as not to impair the operator's movements.

(ii) The canopy framework shall consist of at least two arches, either transverse or longitudinal. If transverse, one arch shall be installed behind the operator and one immediately in front of the operator. They shall be joined at the top by at least two longitudinal braces. There shall be two braces which shall act as deflecting guards extending from the leading edge of the forward arch to the front part of the frame of the tractor. If longitudinal arches are used, they shall be extended from behind the operator to the front part of the frame and each arch shall have an intermediate support located immediately ahead of the operator so that ingress or egress is not impeded. Regardless of the type of construction used, the fabrication and method of connecting to the tractor shall be of such design as to develop a strength equivalent to the upright members.

(iii) The overhead covering shall be of solid material and extend the full width of the canopy.

(iv) The lower portion of cab shall be completely enclosed with solid material, except at entrances, to prevent the operator from being injured from obstacles entering the cab.

(v) The upper rear portion of cab shall be fully enclosed with open mesh material with openings of such a size as to reject the entrance of an object larger than 1¾ inch in diameter. It shall provide maximum rearward visibility.

(vi) Open mesh shall be extended forward as far as possible from the rear corners of the cab sides so as to give the maximum protection against obstacles, branches, etc., entering the cab area.

(vii) Deflectors shall also be installed ahead of the operator to deflect whipping saplings and branches. These shall be located so as to not impede ingress or egress from the compartment.

(viii) The entrance opening of the canopy shall be not less than 52 inches in vertical height.

(ix) Where glass is used it shall be safety glass. An approved substitute may be used.

(*a*) An additional metal screen shall be used where glass alone is not adequate operator protection.

(*b*) Provision shall be made to clean glass to assure adequate visibility.

(3) *Guards.* Guards shall be provided for exposed moving elements such as shafts, pulleys, belts, conveyors, and gears in accordance with § 1910.219 and American National Standard Safety Code for Conveyors, Cableways, and Related Equipment, B20.1—1957. Guards shall be in place at all times machine is in operation.

(4) *Mufflers.* Mufflers provided by the manufacturer or their equivalent shall be in place at all times the machine is in operation.

(5) *Guylines.* Guylines shall be arranged in such manner that stresses will be imposed on not less than two guylines. Stumps used for anchoring guylines shall be carefully chosen as to position and strength. They shall be tied back if necessary. Standing trees shall not be used for this purpose.

(6) *Stability and reliability.* Crane and loader stability and boom reliability shall be in accordance with American National Standard Safety Code for Cranes, Derricks and Hoists Overhead and Gantry Cranes, B30.2.0—1967, and American National Standard Safety Code for Cranes, Derricks and Hoists—Crawler, Locomotive, and Truck Cranes, B30.5—1968.

(e) *Pulpwood harvesting*—(1) *Felling, general.* (i) Work areas shall be assigned such that a tree cannot fall into an adjacent work area. The recommended distance between workers is twice the height of trees being felled.

(ii) When trees may fall into public roads a flagman shall be assigned to direct traffic.

(iii) Workers shall be instructed not to approach a feller closer than twice the height of trees being felled until the feller has acknowledged the signal of approach.

(iv) Lodged trees shall be pulled to the ground at first opportunity with mechanical equipment or animal.

(v) Workers shall be instructed not to work under a lodged tree.

(vi) Special precautions shall be taken to prevent felling trees into powerlines.

(vii) If a tree does make contact with a powerline the power company shall be notified immediately and all personnel shall remain clear of the area until power company personnel advises that conditions are safe.

(2) *Manual felling.* (i) The feller shall be instructed to plan retreat path and clear path as necessary before cut is started.

(ii) The feller shall be instructed to appraise situation for dead limbs, the lean of tree to be cut, wind conditions, location of other trees and other hazards and exercise proper precautions before cut is started.

(iii) Undercuts shall be about one-third the diameter of the tree to guide tree and reduce possibility of splitting. (Local practice where small diameter trees are felled without being undercut is acceptable if the direction of fall is controlled by the practice.)

(iv) Back or felling cut shall be parallel to the inner edge of the undercut and approximately two inches higher than the undercut.

(v) The saw shall be shut off before feller starts his retreat.

(vi) On terrain where trees are likely to slide or roll fellers shall be instructed to fell trees from the uphill side and arrange to keep uphill from previously felled trees.

(3) *Bucking.* (i) Bucking on slopes shall be from the uphill side unless the log has been securely blocked to prevent rolling or swinging.

(ii) Spring poles and trees under stress shall be cut so that employee is clear when the tension is released. (This is accomplished by cutting under the bend.)

(iii) Trees piled for bucking shall be piled in an orderly parallel manner that minimizes hazard to employees.

(4) *Limbing.* Spring poles and limbs under stress shall be cut in such a manner that the employee is clear when tension is released.

(5) *Mechanical debarking and delimbing.* Guarding shall be provided so as to protect employees from flying chunks, logs, chips, bark, limbs, and other material and to prevent the worker from contacting moving parts.

(6) *Skidding and prehauling, general*—(i) Only a designated, trained operator shall operate a skid or prehaul machine.

(ii) Choker setters shall work on uphill side of log.

(iii) No passenger personnel shall ride on a prehaul vehicle, logs, pallets, skid pans or other load unless adequate seating and protection is provided except on animal powered wagons.

(iv) Chokers shall be positioned near the end of the log or tree length to allow turning of the prehaul vehicle, to prevent the penetration of the operator station and to reduce possibility of striking the wheel or track.

(v) During winching, the equipment shall be positioned so that the winch line is in alignment with the long axis of the prehaul machine.

(vi) A stuck or inoperative vehicle shall be towed. A loaded pallet shall not be pushed.

(vii) Stakes shall not be added to permit a load beyond the rated capacity of pallets and trailers.

(viii) The operator shall be instructed to be observant and cautious of height of load and vehicle when traveling under trees, limbs, and other overhead obstructions.

(7) *Skidding and prehauling equipment requirements.* (i) Arches, fairleads, drawbars, hitches and bumpers or fenders shall be designed and constructed to allow a minimum radius vehicle turn without the load contacting a rear tire or the rear of a track assembly.

(ii) Towed equipment such as skid pans, pallets and trailers shall be attached in such a manner as to allow a full 90° turn, prevent overrunning of the towed vehicle, and assure control of the towed equipment.

(iii) Animal towed equipment shall be equipped with a hand brake within reach of the driver.

(iv) Prehaulers shall have a means for securely retaining pallets or pulpwood.

(v) Prehaulers shall have a means of securely retaining loader for transport when so equipped.

(vi) Provision shall be made to securely fasten and to protect all tools and material on the carrier.

(8) *Personnel transport.* (i) The driver shall be properly licensed.

(ii) Flammable liquids shall not be transported on personnel carriers unless a safe and adequate compartment is provided.

(iii) Seats shall be securely fastened.

(9) *Off highway truck transport.* Truck drivers shall be instructed to stop their vehicles, dismount, check and tighten loose load binders, either just before or immediately after leaving a private road to enter a public road.

(10) *Manual loading.* (i) The carrier shall be positioned to provide safe working clearance between carrier and pile.

(ii) Proper lifting techniques shall be used, i.e., straight back and bend knees.

(iii) The stick shall be placed in the carrier in such manner that it is or will be properly secured.

(iv) Manual handling shall be limited to a weight consistent with safe practices.

(11) *Machine loading.* (i) Piles shall be located to provide a safe work area.

(ii) Only the machine operator and slingman, where used, shall be in the work area.

(iii) The load shall be positioned for balance and to prevent slippage or loss. Slings shall be placed to secure and balance the load.

(12) *Storage.* Piles shall be located and constructed in a manner to provide safe working area around them.

(13) *Banding and piling bundles.* (i) Steel bands in good condition shall be used.

(ii) Bands shall be placed when bundle is close to ground.

(iii) No part of the body shall be under the bundle at any time. Bundles shall be placed on runners. Bundles may be double stacked with top end bundle one half or more back from the lower rank end bundle.

(14) *Chipping (in-woods locations).* (i) Access covers or doors shall not be opened until the drum or disk is at a complete stop.

(ii) Infeed and discharge ports shall be designed to prevent contact by personnel with disc, knives, or blower blades.

(15) *Roads and trials, general.* (i) Roads shall be maintained and hazardous conditions corrected.

(ii) Where vision is limited warnings shall be posted.

(iii) Curve radii shall be the maximum consistent with terrain.

(iv) When nightwork is necessary adequate lighting shall be provided.

(v) Local road standards and maximum weight of traffic expected shall be used as guides for materials, construction features and drainage.

(16) *Road and trail pioneering and earthwork.* (i) Banks at the borrow area shall be sloped to prevent slides.

(ii) Backfill shall be adequately compacted.

(iii) Roadside banks shall be sloped or stabilized to prevent slides.

(iv) Overhanging banks, large rocks and debris shall be removed or secured.

(v) Where riprap is used the material and design shall assure safe containment of material.

(vi) Trees or snags which may fall into the road shall be felled.

(17) *Road and trail drainage.* (i) Drainage shall be provided to prevent washouts and landslides.

(ii) Culverts shall be of adequate strength and of a size to handle maximum runoff.

(iii) Where necessary, ditches and banks shall be stabilized by vegetation, riprap or other adequate means.

(18) *Road and trail surfacing.* Road surface shall be properly compacted, graded and crowned.

(19) *Bridges.* (i) Construction shall provide for maximum anticipated loads and side thrust with a substantial safety factor.

(ii) Bridges shall be decked and curbed.

(f) *Effective dates.* (1) The provisions of this § 1910.266 shall become effective on August 27, 1971, except as provided in the remaining subparagraphs of this paragraph.

(2) Paragraph (d)(2) of this section shall become effective on February 15, 1972.

(3) Notwithstanding anything in subparagraph (1), (2), or (4) of this paragraph, any provision in any other paragraph of this section which contains in itself a specific effective date or time limitation shall become effective on such date or shall apply in accordance with such limitation.

(4) Notwithstanding anything in subparagraph (1) of this paragraph, if any standard in 41 CFR Part 50-204, other than a national consensus standard incorporated by reference in § 50-204.2 (a)(1), is or becomes applicable at any time to any employment and place of employment, by virtue of the Walsh-Healey Public Contracts Act, or the Service Contract Act of 1965, or the National Foundation on Arts and Humanities Act of 1965, any corresponding established Federal standard in this § 1910.266 which is derived from 41 CFR Part 40-204 shall also become effective, and shall be applicable to such employment and place of employment, on the same date.

§ 1910.267 Agricultural operations.

(a)(1) The standards referenced in the remaining subparagraphs of this paragraph apply to the indicated operations, whether or not they include as a part of, agricultural operations.

(2) Sanitation in temporary labor camps—§ 1910.142.

(3) Storage and handling of anhydrous ammonia—§ 1910.111 (a) and (b).

(4) Pulpwood logging—§ 1910.266.

(5) Slow-moving vehicles—§ 1910.145.

(b) Except to the extent specified in paragraph (a) of this section, the standards contained in Subparts B through S of this part do not apply to agricultural operations.

(c) The development of standards having more general application to agricultural operations will be the subject of study under section 6 of the Act.

§ 1910.268 Sources of standards.

Sec.	*Source*
1910.261	ANSI P1.1—1969, Safety Standard for Pulp, Paper, and Paperboard Mills.
1910.264	ANSI L1.1—1956, Textile Safety Code.
1910.263	ANSI Z50.1—1947, Safety Code for Bakery Equipment.
1910.262	ANSI Z8.1—1961, Safety Code for Laundry Machinery and Operations.
1910.265	ANSI O2.1—1969, Safety Requirements for Sawmills.
1910.266	ANSI O3.1—1970, Pulpwood Logging Safety Standards.

§ 1910.269 Standards organizations.

Specific standards of the following organizations have been referenced in this subpart. Copies of the referenced standards may be obtained from the issuing organizations. The names and addresses of the issuing organizations are as follows:

American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.

National Fire Protection Association (NFPA), 60 Batterymarch Street, Boston, MA 02110.

American Society of Mechanical Engineers, Inc., United Engineering Center, 345 East 47th Street, New York, NY 10017.

Institute of Markers of Explosives, 420 Lexington Avenue, New York, NY 10017.

Underwriters Laboratories, Inc., 207 East Ohio Street, Chicago, IL 60611.

Subpart S—Electrical

§ 1910.308 Application.

(a) *General.* Section 1910.309 adopts as a national consensus standard the National Electrical Code NFPA 70-1971; ANSI C1-1971 (Rev. of 1968), which is incorporated by reference in this subpart.

(b) *Purpose of the National Electrical Code.* (1) The purpose of the National Electrical Code is the practical safeguarding of any persons and of buildings and their contents from hazards arising from the use of electricity for light, heat, power, radio, signaling, and for other purposes. The standards contained therein are occupational safety and health standards to the extent that they safeguard any person who is an employee of an employer.

(2) The National Electrical Code con-

tains basic minimum provisions considered necessary for safety.

(c) *Scope*—(1) *Covered.* The provisions of this Subpart S cover electrical installations and utilization equipment installed or used within or on public and private buildings, structures and other premises including:

(i) Yards,

(ii) Carnivals,

(iii) Parking lots,

(iv) Mobile homes,

(v) Recreational vehicles,

(vi) Conductors that connect an installation to a supply of electricity, and

(vii) Other outside conductors adjacent to the premises.

(2) *Not covered.* The provisions of this subpart do not cover:

(i) Installations in ships, watercraft, railway rolling stock, aircraft or automotive vehicles,

(ii) Installations underground in mines,

(iii) Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations used exclusively for signaling and communication purposes,

(iv) Installations of communication equipment under exclusive control of communication utilities, located outdoors or in building spaces used exclusively for such installation, or

(v) Installations under the exclusive control of electric utilities for the purpose of communication, metering or for the generation, control, transformation, transmission, and distribution of electric energy, located in buildings used exclusively by the utilities for such purposes or located outdoors on property owned or leased by the utilities or on public highways, streets, roads, etc., or outdoors by established rights on private property.

(d) *Definitions applicable to this Subpart S*—(1) *Approved.* Some provisions of the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968), which is adopted in this Subpart S, require installations or equipment to be approved. In Article 100 of the Code, "approved" is defined to mean "acceptable to the authority enforcing this Code." The authority enforcing the Code under subpart S is the Assistant Secretary of Labor for Occupational Safety and Health. The definitions in this subsection indicate what is acceptable to the Assistant Secretary of Labor, and therefore approved within the meaning of the Code as incorporated in this subpart S.

(2) *Acceptable.* An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this Subpart S: (i) If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory, such as, but not limited to, Underwriters' Laboratories, Inc. and Factory Mutual Engineering Corp.; or (ii) with respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another Federal agency, or by a State, municipal, or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with the provisions of the National Electrical Code as applied in § 1910.309; or (iii) with respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by, a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary and his authorized representatives.

(3) For purposes of subparagraph (2) of this paragraph:

(i) *Listed.* Equipment is "listed" if it is of a kind mentioned in a list which, (*a*) is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and (*b*) states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner;

(ii) *Labeled.* Equipment is "labeled" if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which, (*a*) makes periodic inspections of the production of such equipment, and (*b*) whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner;

(iii) *Accepted.* An installation is "accepted" if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes;

(iv) *Certified.* Equipment is "certified" if it, (*a*) has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or (*b*) is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and (*c*) it bears a label, tag, or other record of certification;

(v) *Utilization equipment.* Utilization equipment means equipment which utilizes electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

§ 1910.309 National Electrical Code.

(a) The requirements contained in the following articles and sections of the National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968) shall apply to all electrical installations and utilization equipment:

Articles:

500	Hazardous Locations.
501	Class I Installations (Hazardous Locations).
502	Class II Installations (Hazardous Locations).
503	Class III Installations (Hazardous Locations).

Sections:

250–58 (a) and (b).	Equipment on Structural Metal.
250–59 (a), (b), and (c).	Portable and/or Cord Connected and Plug Connected Equipment, Grounding Method.

Sections—Continued:

400–3 (a) and (b)	Flexible Cords and Cable, Uses.
400–4	Flexible Cords and Cable Prohibited.
400–5	Flexible Cords and Cables. Splices.
400–9	Overcurrent Protection and Ampacities of Flexible Cords.
400–10	Pull at Joints and Terminals of Flexible Cords and Cables.
422–8	Installation of Appliances with Flexible Cords.
422–9	Installation of Portable Immersion Heaters.
422–10	Installation Appliances Adjacent to Combustible Material.
422–11	Stands for Portable Appliances.
422–12	Signals for Heated Appliances.
422–14	Water Heaters.
422–15 (a), (b), and (c).	Installation of Infrared Lamp and Industrial Heating Appliances.
110–14 (a) and (b).	Electric Connection.
110–17 (a), (b), and (c).	Grounding Live Part.
110–18	Arcing Parts.
110–21	Marking.
110–22	Identification.
240–16 (a), (b), (c), and (d).	Location in Premises for Overcurrent Protection Devices.
240–19 (a) and (b).	Guarding of Arcing or Suddenly Moving Parts of Overcurrent Protection Devices.
250–3 (a) and (b)	D.C. System Grounding.
250–5 (a), (b), and (c).	A.C. Circuits and Systems To Be Grounded.
250–7	Circuits Not To Be Grounded.
250–42 (a), (b), (c), and (d).	Fixed Equipment Grounding, General.
250–43 (a), (b), (c), (d), (e), (f), (g), (h), and (i).	Fixed Equipment Grounding, Specific.
250–44 (a), (b), (c), (d), and (e).	Nonelectrical Equipment, Grounding.
250–45 (a), (b), (c), and (d).	Equipment Connected by Cord and Plug, Grounding.
430–142 (a), (b), (c), and (d).	Stationary Motor, Grounding.
430–143	Portable Motors, Grounding.
250–50 (a) and (b).	Equipment Grounding Connections.
250–51	Effective Grounding.
250–57 (a) and (b).	Fixed Equipment Method of Grounding.
422–16	Appliance Grounding.
422–17	Installation of Wall-mounted Ovens and Counter - mounted Cooking Units.

(b) Every new electrical installation and all new utilization equipment installed after March 15, 1972, and every replacement, modification, or repair or rehabilitation, after March 15, 1972, of any part of any electrical installation or utilization equipment installed before March 15, 1972, shall be installed or made, and maintained, in accordance with the provisions of the 1971 National Electrical Code, NFPA 70–1971; ANSI C1–1971 (Rev. of 1968).

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Subject Term	Section No.	Federal Register Page No.
Abrasive Blasting:		
Air Supply & Air Compressors	.94(a)(6)	
Blast Cleaning Enclosures	.94(a)(3)	
Dust Hazards	.94(a)(2)	
Exhaust Systems	.94(a)(4)	
Guarding	.243(c)(1)(i)	
Nozzle	.244(b)	
Personal Protective Equipment	.94(a)(5)	
Abrasive Wheel Machinery:		
Figure 0-6 (Grinding Wheel Angular Exposure)	.215	
Figure 0-7 (Grinding Wheel Angular Exposure)	.215	
Figure 0-8 (Grinding Wheel Angular Exposure)	.215	
Figure 0-9 (Grinding Wheel Angular Exposure)	.215	
Figure 0-10 (Cylinder Grinder Angular Exposure)	.215	
Figure 0-11 (Cylinder Grinder Angular Exposure)	.215	
Figure 0-12 (Surface Grinder & Cutting-Off Machine Angular Exposure)	.215	
Figure 0-13 (Surface Grinder & Cutting-Off Machine Angular Exposure)	.215	
Figure 0-14 (Swing Frame Grinder Angular Exposure)	.215	
Figure 0-15 (Swing Frame Grinder Angular Exposure)	.215	
Figure 0-16 (Top Grinder Angular Exposure)	.215	
Figure 0-17 (Top Grinder Angular Exposure)	.215	
Figure 0-18 (Angular Exposure Adjustment)	.215	
Figure 0-19 (Angular Exposure Adjustment)	.215	
Figure 0-20 (Angular Exposure Adjustment)	.215	
Figure 0-21 (Angular Exposure Adjustment)	.215	
Figure 0-22 (Angular Exposure Adjustment)	.215	
Figure 0-23 (Angular Exposure Adjustment)	.215	
Figure 0-24 (The Type 27A Wheel Mounted Between Flat Nonrelieved Flanges of Equal Bearing Surfaces)	.215	
Figure 0-24a (Types 27 and 28 Wheels Safety Guard)	.215	
Figure 0-25 ("Tap" Spot Locations)	.215	
Figure 0-26 ("Tap" Spot Locations)	.215	
Figure 0-27 (Cutting-Off Wheel Safety Guard)	.215	
Figure 0-28 (Cutting-Off Wheel Safety Guard)	.215	
Figure 0-29 (Band Type Guard Dimensions)	.215	
Figure 0-30 (Minimum Dimensions for Straight Relieved Flanges)	.215	
Figure 0-31 (Minimum Dimensions for Straight Unrelieved Flanges)	.215	
Figure 0-32 (Driving Flange Secured to Spindle)	.215	
Figure 0-33 (Central Nut Mounting)	.215	
Figure 0-34 (Multiple Screw Mounting)	.215	
Figure 0-35 (Minimum Dimensions for Precision Grinding Machine Straight Flanges)	.215	
Figure 0-36 (Cutting-Off Wheel Safety Guards)	.215	
Figure 0-37 (Cutting-Off Wheel Safety Guards)	.215	
Flanges	.215(c)	
General Requirements	.215(a)	
Guarding Abrasive Wheel Machinery	.215(b)	
Mounting	.215(d)	
Abrasive Wheels:		
Guarding	.243(c)	
Table 0-1 (Minimum Basic Thickness for Peripheral and Side Members for Safety Guards used with Cutting-Off Wheels)	.215	
Table 0-2 (Exposure Versus Wheel Thickness)	.215	
Table 0-3 (Guide for Construction of Band Type Guards)	.215	
Table 0-4 (Minimum Dimensions for Straight Unrelieved Flanges for Wheel With Threaded Inserts or Projecting Studs)	.215	
Table 0-5 (Minimum Dimensions for Straight Adaptor Flange For Organic Bonded Wheels Over 1¼ Inches Thick)	.215	
Table 0-6 (Minimum Dimensions For Straight Relieved Flanges)	.215	
Table 0-7 (Minimum Dimensions for Straight Flanges—For Mechanical Grinders 12.500-16.500 S.F.P.M.)	.215	
Table 0-8 (Minimum Dimensions for Straight Flanges Used as Wheel Sleeves for Precision Grinding Only)	.215	
Table 0-9 (Minimum Basic Thickness of Peripheral Size Members for Safety Guards)	.215	
Wheel Flanges	.215(c)	
Wheel Machinery Guards	.215(b)	
Wheel Mounting	.215(d)	
Wheel Terms	.241(b)	
Access to Exits	.37(f)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Accident Prevention Responsibilities:		
Abrasive Wheels	.215	
Compressed Air	.169(a)	
Contaminants	.93	
Receivers	.169(a)	
Accident Prevention Signs, Tags	.145	
Acetylene Cylinders	.102(a)	
Filling Systems	.102(c)	
Generators	.102(c)	
Piping Systems	.102(b)	
AEC Agreement, States	.96(p)	
Contractor's Operating Plants	.96(p)	
Licensees	.96(p)	
Agriculture Operations	.267	
Air:		
Compressed, Cleaning	.242(b)	
Contaminants	.93	
Receivers	.169	
Table G-1 (Threshold Limit Values of Airborne Contaminants for 1970—American Conference of Governmental Industrial Hygienists)	.93	
Table G-2 (Threshold Limit Values of Airborne Contaminants—American National Standards Institute)	.93	
Table G-3 (Mineral Dusts)	.93	
Air Receivers:		
General	.169(a)	
Installation	.169(b)	
Aisles & Passageways	.22 (b)	
Alarm Valves	.159(c)(2)	
Alarms:		
Fire	.37(n)	
Mills	.216(g)	
Rubber & Plastics	.216(g)	
Sprinklers	.159(c)	
Ammonia:		
Anhydrous, Storage & Handling	.111(a)	
Mounted on Farm Vehicles	.111 (g) & (h)	
Nitrate, Storage	.109(i)	
Portable Containers	.111(e)	
Tanks, Transporting	.111(f)	
Anchoring Fixed Machinery	.212(b)	
Anhydrous Ammonia, Storage & Handling of:		
Basic Rules	.111(b)	
General	.111(a)	
Refrigerated Storage Systems	.111(d)	
Systems Mounted on Farm Vehicles Other Than for the Application of Ammonia	.111(g)	
Systems Utilizing Portable DOT Containers	.111(e)	
Systems Utilizing Stationary, Nonrefrigerated Storage Containers	.111(c)	
Table H-35 (Minimum Distance Locations for Permanent Storage Containers)	.111	
Table H-36 (Minimum Required Discharge Rates)	.111	
Arc Welding & Cutting	.252(b)	
Asbestos	.93(a)	
Caution Signs & Labels	.93a(g)	
Cleanup	.93a(h)	
Dust	.19	
Engineering Controls	.93a(c)	
Fibers	.93a(a)(2)	
Fiber Exposure	.93a(b)	
Measurement Method	.93a(e)	
Medical Examinations	.93a(j)	
Monitoring	.93a(f)	
Personal Protective Equipment	.93a(d)	
Ventilation	.93a(c)(ii)	
Work Practices	.93a(c)(2)	
Audiometer: (see Sound Level Meter).		
Automatic Sprinkler Systems	.159	
Fire Department Connections	.159(b)	
General Requirements	.159(a)	
Maintenance of Sprinkler System	.159(d)	
Signaling Systems	.37(n)(2) .160(b)	
Sprinkler Alarms	.159(c)	
Sprinkler Head Clearance	.159(e)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Automatic Sprinklers	.37(m)	
Automobile Undercoating	.107(k)	
Bakery Equipment	.263	
Biscuit & Cracker Equipment	.263(k)	
Definitions	.263(b)	
Dividers	.263(f)	
Dough Brakes	.263(h)	
Flour Handling	.263(d)	
General Machine Guarding	.263(c)	
General Requirements	.263(a)	
Miscellaneous Equipment	.263(i)	
Mixers	.263(e)	
Moulders	.263(g)	
Ovens	.263(l)	
Slicers & Wrappers	.263(j)	
Band Saws & Band Resaws	.213(i)	
Barking Devices	.261(c)(12)	
Barrel Sanding Machines	.214(p)	
Barrel Stave Saws	.214(c)	
Barrier Guard, Fixed	.211(d)(34)	
Bathing Facilities, Labor Camps	.142(f)	
Batteries, Storage	.178(g)	
Bearings, Power Transmission	.219(j)	
Belts, Ropes & Chain Drives	.219(e)	
Belts, Shifters, Clutches, Shippers, Poles, Perches & Fasteners	.219(l)	
Bending, Forging Machines	.211(e)(1)	
Bilge Truss Hoop Removing Machinery	.214(n)	
Blast Cleaning Enclosures	.94(a)(3)	
Blasting Agents, Bulk Delivery & Mixing	.109(h)(4) .109(g)(3)	
Blasting Agents, Fixed Location Mixing	.109(g)(2) .109(H)(3)	
General	.109(g)	
Miscellaneous Provisions	.109(b)	
Storage	.109(f)(4), 109(G)(4)	
Use	.109(e)	
Boatswain's Chair: (see Scaffolds)	.28(j)	
Bolt Equalizer, Stave & Heading Saws	.214(b)	
Boom	.180(a)(13)	
Boring Machines	.213(1)	
Brackets, Roofing	.28(s)	
Brakes:		
Disc-Type (Power Platforms)	.66(a)(4)	
Hoisting Machines	.66(c)(19)	
Presses	.217(a)(2)	
Self-Energizing Band-Type (Power Platforms)	.66(a)(5)	
Shoe-Type (Power Platforms)	.66(a)(6)	
Tracks & Railroads	.178(l)	
Bridge Plate, Industrial Trucks	.178(j)	
Buffing Operation	.94(b)	
Building Facilities	.265(c)	
Building Service Equipment	.177(f)	
Bulk Plants, Combustible & Flammable Liquids	.106(f)	
Bumpers, Cranes, Overhead Gantry	.179(e)(2)	
Cabs, Overhead Gantry Cranes	.179(c)	
Cadmium, Welding	.252(f)(9)	
Cages, Fixed Ladders	.27(d)	
Calenders	.216	
Definition	.262(b)(3),(d	
Protection by Location	.216(d)	
Safety Controls	.216(c)	
Calcium Carbide	.252(a)(7)	
Canopy, Protective	.266(d)(2)	
Capacity:		
Exits	.37(c)	
Occupant Load, Egress	.37(d)	
Width, Egress Means	.37(c)	
Carbon Dioxide Extinguishing System	.161	
General Requirements	.161(a)	
Inspection and maintenance	.161(b)	
Carbon Tetrachloride	.179(e)(3)	
Carboys, Acid	.266(nn)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Cargo Handling (Flammable)	.106(e)(4)	
Cargo and Portable Tank Storage	.168	
Caulking (Exterior)	.66(b)(1)(ii)	
Caustics	.262(oo)	
Caution Signs:		
Asbestos	.93a(g)	
Radiation	.96(e)	
Change Rooms (Personnel)	.141(e)	
Chains	.265(c)(24)	
Falls and Pull Lifts	.263(h)(12)	
Saws	.266(c)(5)	
Chemical:		
Bulk Plant (Definition)	.106(a)(7)	
Bulk Plants	.106(f)	
Chemical Plants	.106(i)	
Container and Portable Tank Storage	.106(d)	
Dip Tanks	.108	
Distilleries	.106(i)	
Flammables or Combustibles, Storage	.106(b), (d) .106(d) .107(e) .106(f) .106(g)	
Industrial Plants	.106(e)	
Piping, Valves, & Fittings	.106(c)	
Processing Plants	.106(h)(3)	
Refineries	.106(i)	
Service Stations	.106(g)	
Storage Tanks	.106(b)	
Toilets	.143(a)(3) .143(c)	
Chicken Ladders	.28(t)	
Chippers	.265(c)(21)	
Chlorinated Hydrocarbons	.252(f)(11)(i)	
Circular Resaws	.213(e)	
Circular Saws, Self-Fed	.213(f)	
Clips, Wire	.179(h)(2)	
Clothing, Protective	.94(d)(9)	
Coatings, Powdered	.107(a)(1)	
Collars & Couplings	.219(i)(1)	
Color Codes, Physical Hazards	.44	
Combustible Liquids:		
Definition	.106(a)(18)	
Piping	.106(c)	
Storage	.106 (b), (d)	
Commercial Vehicles, LP Gas	.110(g)	
Communicable Diseases Reporting, Labor Camps	.141(l)	
Communications, Manlifts	.66(c)(23)	
Compressed Air	.242(b)	
Compressed Gas Cylinders:		
Corrosion or Pitting	.166(c)(3)	
Definition	.166(a)	
Dents	.166(c)(v)	
Flow Capacity (Definition)	.167(a)(17)	
Frangible Disc (Definition)	.167(a)(6)	
Fusible Plug (Definition)	.167(a)(9)	
Handling, Storage, Utilization	.161(b)	
High-low Pressure (Definition)	.166(a)(1)	
Inspection, General Requirements	.166(b)	
Pressure Opening (Definition)	.167(a)(7)	
Relief Devices	.167	
Set Pressure (Definition)	.167(a)(15)	
Table M-1 (Minimum Allowance Wall Thickness For Certain Common Size Low-Pressure Cylinders)	.166	
Wall Thickness	.166(c)(3)(iii)	
Yield Temperature (Definition)	.167(a)(10)	
Confined Spaces, Welding & Cutting	.252(e)(4)	
Construction:		
Dip Tanks	.108(c)	
Operations, Egress	.36(c)	
Power Press, Mechanical	.217(b)	
Containers, Portable Tank Storage	.106(d)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Containers:		
Anhydrous Ammonia	.111(b)(2)	
Hydrogen	.103(b)(1)(i)	
LPG	.110(b) (4), (5), (6)	
Oxygen Fuel Gas	.252(a)(2)	
Welding & Cutting	.252(d)(3)	
Contaminants	.93(a)	
Conveyors:		
Pulp	.261(f)(4)	
Bakery	.263(d)(7)	
Cooperage Machines	.214, .220	
Corrosion Protection, Tanks	.106(b)(1)(vi) .106(b)(3)(iii)	
Counterweights, Cranes, Crawlers, Truck	.180(i)(2)	
Coupling & Collars	.219(i)	
Covers & Guardrails	.22(c)	
Cranes:		
Cabs, Overhead Gantry	.179(c)	
Crawlers, Locomotive Truck	.180	
General Requirements	.180(b)	
Inspection Classification	.180(d)	
Inspections, Overhead Gantry	.179(j)	
Load Handling	.180(h)	
Load Ratings	.180(c)	
Maintenance	.180(f)	
Operating Near Electric Powerlines	.180(j)	
Overhead Gantry	.179	
Brakes	.179(f)	
Definition	.179(a)	
Electric Equipment	.179(g)	
Footwalks & Ladders	.179(d)	
Load Handling	.180(b)	
Maintenance	.179(l)	
Rope Inspection	.179(m)	
Stops, Bumpers, Rail Sweeps & Guards	.179(e)	
Testing	.179(k)	
Warning Devices	.179(i)	
Requirements	.180(i)	
Rope Inspection	.180(g)	
Testing	.180(e)	
Crawling Boards	.28(t)	
Crawler Locomotive & Truck Cranes:		
Definitions	.180(a)	
General Requirements	.180(b)	
Inspection Classification	.180(d)	
Load Handling	.180(h)	
Load Ratings	.180(c)	
Maintenance Procedures	.180(f)	
Operating Near Electric Powerlines	.180(j)	
Requirements	.180(i)	
Rope Inspections	.180(g)	
Testing	.180(e)	
Crosscut Saw, Hand-Fed	.213(d)	
Crozing Machines	.214(k)	
Cups, Drinking	.141(b)(1)	
Curing, Spray Finish	.107(j)	
Cutoff Swing Saws	.213(g)	
Cylinders, Compressed Gas:		
Definitions	.166(a)	
High Pressure	.166(e)	
Inspections	.101(a)	
Internal Inspections	.166(f)	
Requirements	.166(b)	
Safety relief devices	.101(c)	
Cylinders, General:		
Acetylene	.102(a)	
Hydrogen	.103(b)(1)(i)	
LPG & Gas Consuming Heaters	.110(c)(1)	
Respirators	.134(d)(2)(i)	
Welding & Cutting, Approval & Marking	.252(a)(2)	
Dates, Effective:		
Hazardous Materials	.114	
Machine Guarding	.220	
Pulpwood Logging	.266(f)	
Specific Variations in Effective Dates:		
Abrasive Wheel Machinery	.220	
Acetylene	.114	
Anhydrous Ammonia	.114	
Automatic Sprinkler Systems	.165	
Carbon Dioxide Extinguisher Systems	.165	
Compressed Gases	.114	
Cooperage Machinery	.220	
Crawler, Locomotive & Truck Cranes	.182	
Dip Tanks	.114	
Fixed Dry Chemical Fire Extinguishers	.165	
Flammable & Combustible Liquids	.114	
General Requirements, All Machines	.220	
Guarding Portable Power Tools	.245	
Hydrogen	.114	
Indoor General Storage	.182	
LPG Storage and Handling	.114	
Mechanical Power Presses	.220	
Mechanical Power Transmission	.220	
Nitrous Oxide	.114	
Overhead & Gantry Cranes	.182	
Portable Fire Extinguishers	.165	
Powered Industrial Trucks	.182	
Pulp, Paper & Paperboard Mills	.261(n)	
Pulpwood Logging	.266(f)	
Sanitation	.138	
Sawmills	.265(j)	
Spray Finishing	.114	
Standpipe & Hose Systems	.165	
Ventilation	.98	
Woodworking Machinery	.220	
Derricks	.181(a)	
Definition	.181(a)	
Guards	.181(j)(1)	
Inspection	.181(d)	
Load Handling	.181(i)	
Load Rating	.181(c)	
Maintenance	.181(f)	
Operation	.181(h)	
Requirements	.181(b), .181(j)	
Rope Inspection	.181(g)	
Testing	.181(e)	
Dies, Design, Construction, Setting, & Feeding	.217(d)	
Dining Facilities, Labor Camps	.142(i)	
Dip Tanks:		
Construction	.108(c)	
Covers	.108(g)(6)	
Definitions	.108(a)	
Fire extinguishment	.108(g)	
Flammable liquids	.108(a)	
Hardening tanks	.108(h)	
Ignition, electrical & other sources	.108(e)	
Liquids, storage & handling	.108(d)	
Maintenance	.108(f)	
Operation	.108(f)	
Special applications	.108(h)	
Tempering	.108(h)	
Ventilation	.108(b)	
Disk, Shields and "U" Guards	.219(n)	
Disposal Systems, Nonwater Carrying	.143	
Distilleries, Refineries & Chemical Plants	.106(i)	
Dividers, Bakery Equipment	.263(f)	
Dockboards, Industrial Trucks	.178(j)	
Doors	.252(a)(6)	
Dough Brakes, Bakery Equipment	.263(h)	
Drainage, Materials Handling	.176(d)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Dressing Rooms, Personnel	.141(e)	
Drives, Belt, Rope & Chain	.219(e)	
Dry Chemical Extinguishers	.160	
Drying, Spray Finishes	.107(j)	
Dual Component Coatings	.107(m)	
Dust Hazards:		
Asbestos	.19	
General	.94(a)(2)	
Effective Dates: (See Dates, Effective).		
Egress, Means of: (See Means of Egress)	.35	
Electric Equipment, Overhead Gantry Cranes	.179(g)	
Electric Power Lines, Cranes—Locomotive, Crawler, Truck	.180(j)	
Electrical:		
General Application	.308	
Ignition Source, Spray Finishing	.107(c)	
Ignition Source, Dip Tanks	.108(e)	
Shock, Personnel Protection	.137	
Electromagnetic Radiation	.97(a)	
Electrostatic Apparatus, Spray Finishing	.107(h)	
Elevated Work Platforms, Vehicle Mounted	.67	
Emergency Switches, Mills & Calanders	.216(e)	
Employee Records, Radiation Exposure	.96(m), (n), (o)	
Employee Protection	.132(b)	
Employer Records, Radiation Exposure	.96(n)	
Enclosures, Blast Cleaning Room	.94(a)(1)(iv)	
Environmental Control:		
Accidents Prevention Signs & Tags	.145	
Nonwater Carriage Disposal Systems	.143	
Safety Color Codes	.144	
Sanitation	.141	
Temporary Labor Camps	.141(h)	
Evacuation, Signals	.96(f)	
Exhausts:		
Spray Finishing	.107(d)(2)	
Tanks, Storage	.94(d)(11)	
Vats & Dip Tanks	.108(b)(1)	
Exhaust Systems (Ventilation)	.94(d)(3)	
Exits:		
Access	.37(f)	
Access, Exterior Ways	.37(g)	
Access Obstruction	.37(1)	
Arrangement	.37(e)	
Capacity	.37(d)	
Change in Elevation	.37(j)	
Discharge From	.37(h)	
Egress	.37(a)	
Headroom	.37(i)	
Maintenance	.37(k)	
Marking	.37(q)	
Protective Enclosures	.37(b)	
Explosive Actuated Tools	.241(a)	
Guarding	.243(d)	
Explosives & Blasting Agents:		
Atmospheres	.322(b) (2), (3)	
Blasting Agents	.109(g)	
Definitions	.109(a)	
Piers, Railway Stations & Cars or Vessels	.109(f)	
Miscellaneous Provisions	.109(b)	
Storage	.109(c)	
Storage of Ammonium Nitrate	.109(i)	
Table H-21 (American Table of Distances for Storage of Explosives)	.109	
Table H-22 (Table of Recommended Separation Distances for Ammonium Nitrate & Blasting Agents)	.109	
Exposure:		
Airborne Radioactive Materials	.96(c)	
Radiation	.96(b)	
Extractors	.262(y)	
Eye Protection	.133(a)(1)	
Goggles	.133(a)(3)	
Wash Fountains	.151(c)	
Welding	.251(e)(2)	
Face Protection	.133(a)	
Welding	.251(e)(2)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Fans	.263(1)(i)	
Feeding, Facilities, Temporary Labor Camps	.142(3)(i)	
Fiber Ropes	.265(c)(24)	
Filler Metals	.252(a)(4)(ii)(c)	
Filters:		
Lenses	.251(e)(2)	
Respirators	.134(g)(4)	
Fire Alarm and Detection Systems	.37(n)	
Boxes	.163(b)	
Signal systems	.163	
General Requirements	.163(a)	
Maintenance	.163(c)	
Fire Classes	.156(a)	
Fire Sprinkler Systems	.37(m) .159 .156(i)	
Fire Detection, Egress	.37(n)	
Fire Extinguishers:		
Carbon Dioxide	.161	
Dip Tanks	.108(g)	
Fixed Dry Chemical	.160	
Portable, Classification	.156(e)	
Portable, Distribution	.157(c)	
Portable, General Requirements	.157(a)	
Portable, Hydrostatic Test Intervals	.157(d)(4)(j)	
Portable, Inspection & Maintenance	.157(d)	
Portable, Selection	.157(b)	
Table L-1 (Fire Extinguisher Size & Placement for Class A Hazards)	.157	
Table L-2 (Fire Extinguisher Size & Placement for Certain Class B Fires)	.157	
Table L-3 (Hydrostatic Test Interval for Extinguishers)	.157	
Table L-4 (Hydrostatic Test Pressure Requirements—Non-ICC Shells, Shells not Specific in DOT Regulations)	.157	
Fire Hazards Classifications	.156 (f), (g) & (h)	
Fire Prevention Welding Cutting	.252(d)	
Fire Protection:		
Automatic Sprinkler Systems	.159	
Carbon Dioxide Extinguishing Systems	.161	
Definitions	.156	
Effective Date	.165	
Dry Chemical Extinguishing Systems	.160	
Indoor Storage	.177(d)	
Local Fire Alarm Signaling Systems	.163	
Portable Fire Extinguishers	.157	
Spray Finishing	.107(f)	
Standpipe & Hose Systems	.158	
Fire Retardant Paints	.37(o)	
Fire Sprinkler:		
Alarms	.156(j) .159(c) .156(i)	
System	.159 .156(i)	
First Aid	.151	
Labor Camps	.142(k)(i)	
Fixed Barrier Guards	.211(d)(34)	
Fixed Dry Chemical Extinguisher Systems:		
Alarms & Indicators	.160(b)	
General Requirements	.160(a)	
Inspection & Maintenance	.160(c)	
Fixed Industrial Stairs	.24	
Angle of Stairways	.24(e)	
Application of Requirements	.24(a)	
General	.24(k)	
Length	.24(g)	
Open Risers	.24(j)	
Railings & Handrails	.24(h)	
Strength	.24(c)	
Threads	.24(f)	
Vertical Clearance	.24(i)	
Where Required	.24(b)	
Width	.24(d)	

Subject Term	Section No.	Federal Register Page No.
Fixed Ladders	.27	
Clearance	.27(c)	
Design Requirements	.27(a)	
Maintenance	.27(f)	
Pitch	.27(e)	
Requirements	.27(d)	
Specific Features	.27(b)	
Fixed Machinery Anchors	.212(b)	
Flammable Atmospheres	.324(c)(2)(i)	
Flammable & Combustible Liquids	.106	
Bulk Plants	.106(f)	
Container & Portable Tank Storage	.106(d)	
Definitions	.106(a)	
Industrial Plants	.106(e)	
Piping, Valves & Fittings	.106(c)	
Processing Plants	.106(h)	
Refineries, Chemical Plants & Distilleries	.106(i)	
Service Stations	.106(g) (i)	
Table H-5 (Outside Aboveground Tank Locations Regarding Property Lines & Public Ways)	.106(b)(2)(a)	
Table H-6 (Aboveground Tank Locations for Storage of Liquids With Operating Pressure Less than 2.5 P.S.I.G.)	.106(b)(2)(i)(b)	
Table H-7 (Aboveground Tank Locations for the Storage of Flammable or Combustible Liquids With Boil-Over Characteristics)	.106(b)(2)(i)(b)	
Table H-8 (Aboveground Tank Locations for the Storage of Unstable Liquids)	.106(b)(2)(i)(d)	
Table H-9 (Reference Minimum Distances for Use in Tables H-5 to H-8)	.106(b)(2)(i)(e)	
Table H-10 (Wetted Area Versus Cubic Feet Free Air Per Hour)	.106(b)(2)(v)(c)	
Table H-11 (Vent Line Diameters)	.106(b)(3)(iv)	
Table H-12 (Maximum Allowance Size of Containers & Portable Tanks)	.106(d)(2)(iii)	
Table H-13 (Storage in Inside Room)	.106(d)(4)(ii)	
Table H-14 (Indoor Container Storage)	.106(d)(5)(v)	
Table H-15 (Indoor Portable Tank Storage)	.106(d)(5)(v)	
Table H-16 (Outdoor Container Storage)	.106(d)(6)(i)	
Table H-17 (Outdoor Portable Tank Storage)	.106(d)(6)(i)	
Table H-18 (Electrical Equipment Hazardous Areas-Bulk Plants)	.106(f)(5)(iii)	
Table H-19 (Electrical Equipment Hazardous Areas-Service Stations)	.106(g)(i)	
Flammable Liquids:		
Dip Tanks	.108(a)	
Handling & Storage, Dip Tanks	.108(d)	
Spray Finishing	.107	
Storage	.106(b), (d)	
Ventilation	.108(b)	
Flanges, Abrasive Wheels	.215(c)	
Floor Loading Protection	.22(d)	
Floor Openings:		
Covers	.23(a)(3)	
Protection	.23(a)	
Floors, General Requirements	.22(a)	
Flywheel Guarding	.219(b)(1)	
Foodhandling, Labor Camps	.141(h)	
Foot Protection	.136	
Footwalks, Overhead Gantry Cranes	.179(d)	
Forging Facilities Equipment	.218	
Forging, Hot Metal Stamping (Terms)	.211(e)	
Forging Machine Area	.30(b)	
Forging Machines	.218	
General Requirements	.218(a)	
Gravity Hammers	.218(e)	
Hammers, General	.218(b)	
Other Forge Facility Equipment	.218(j)	
Other Forging Equipment	.218(i)	
Power-Driven Hammers	.218(d)	
Presses	.218(c)	
Trimming Presses	.218(g)	
Upsetters	.218(h)	
Fuel Handling, Industrial Trucks	.178(f)	
Fuel Storage, Industrial Trucks	.178(f)	
Fumes (Air Contaminants)	.93	
	.178(i)(1)	

Subject Term	Section No.	Federal Register Page No.
Fuses, Electrical	.312(b)	
Fusion Apparatus, Spray Finishing	.107(j)	
Gangways	.21(a)(5)	
Garnett Machines	.262(b)(13)	
Gases, Compressed	.101, .166	
Compressed Gas Cylinders	.166	
Cylinder Inspection	.101(a), .166	
Fumes Control:		
Industrial Trucks	.178(i)	
General	.93	
Liquified Petroleum (LPG)	.110	
Masks	.134	
Vapors, Fumes, Dusts, Mists	.93	
Gasoline Stations	.106(g)	
Gears, Power Transmission	.219(f)	
General Environmental Controls:		
Nonwater Carriage Disposal Systems	.143	
Safety Color Code for Physical Hazards	.144	
Sanitation	.141	
Specifications for Accident Prevention Signs & Tags	.145	
Temporary Labor Camps	.142	
General Storage:		
Building Service Equipment	.177(f)	
Definitions	.177(a)	
Fire Protection Requirements	.177(d)	
General Requirements	.177(b)	
Mechanical Handling Equipment	.177(e)	
Piling Protection Requirements	.177(c)	
Smoking	.177(g)	
Generators, Acetylene	.252(a)(6)	
Grinders:		
Food	.263(k)(1)(i)	
Guarding	.215(b)	
Ventilation	.94(b)	
Gill Box Machines	.262(k)(2)	
Grounding:		
Combustible Liquids	.107(e)(9)	
Electrical Spray Booths	.107(h)(10)	
Welding Equipment	.252(c)(3)(vi)	
Guarding:		
Abrasive Wheels, Machinery	.215(b)	
Abrasive Wheels, Portable	.243(c)	
Approved Materials	.219(o)	
Belts, Rope & Chain	.219(e)	
Clutches, Cutoffs, Couplings, Pulleys	.219(k)	
Disks, Shields, and "U" Guards	.219(N)	
Explosives Actuated Tools	.243(d)	
Floor Openings	.23(c)	
Flywheel	.219(b)(1)	
Friction Drives	.219(g)	
Mechanical Power Transmission	.219(c)(5)	
Shafts	.219(c)	
Standard Guards	.219(m)	
Gears	.219(f)	
Grinders	.215(b)	
Horizontal Overhead Belts	.219(o)(3)	
Industrial Trucks	.178(e)	
Keys, Set Screws	.219(h)	
Machinery	.212(a)	
Materials Handling Areas	.176(g)	
Mechanical Power Presses	.217(b)	
Pneumatic Tools	.243(b)	
Portable Abrasive Wheels	.243(c)	
Power Lawn Mowers	.243(e)	
Power Presses	.217(c)	
Prime Mover (Flywheels)	.219(b)	
Stairway & Railings	.23(d)	
Wall Openings	.23(b)	
Wood	.219(o)(2)	
Woodworking Tools, Portable	.243(a)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Guarding, Floor & Wall Openings & Holes:		
Protection for Floor Openings	.23(a)	
Protection of Open-Sided Floors, Platforms & Runways	.23(c)	
Protection for Wall Openings & Holes	.23(b)	
Railing, Toeboards & Cover Specifications	.23(e)	
Stairway Railings & Guards	.23(d)	
Hammers, Power Driven	.218(d)	
Forging	.218(b)	
Gravity	.218(e)	
Hand:		
Jointers	.214(s)	
Tools	.242(a)	
Trucks	.263(h)(4)	
Handling:		
Compressed Gases	.107(e)	
Flammable Liquids	.107(e)	
Handling Materials	.176	
Clearance Limits	.176(e)	
Drainage	.176(d)	
Guarding	.176(g)	
Housekeeping	.176(c)	
Rolling Railroad Cars	.176(f)	
Storage	.176(b)	
Mechanical Equipment	.176(a)	
Handrails	.21(a)(3)	
Hardhats (helmets)	.135	
Hatches	.23(a)(3)	
Hazardous Materials:		
Acetylene	.102	
Additional Delay in Effective Date	.114	
Compressed Gases	.101	
Dip Tanks Containing Flammable or Combustible Liquids	.108	
Explosives & Blasting Agents	.109	
Flammable & Combustible Liquids	.106	
Hydrogen	.103	
Nitrous Oxide	.105	
Oxygen	.104	
Sources of Standards	.115	
Spray Finishing	.107	
Standards Organizations	.116	
Storage & Handling of Anhydrous Ammonia	.111	
Storage & Handling of Liquified Petroleum	.110	
Head Bolt Sewing Machines	.214(a)	
Head Charring Machines	.214(m)	
Sanding Machines	.214(r)	
Head Protection	.135	
Heading Jointer & Doweler Machines	.214(h)	
Heading-Up Machines	.214(l)	
Headrooms, Exits	.37(i)	
Heat, Lights, Indoor Storage	.177(f)	
Hearing Protection	.95(a)	
Heating Equipment	.106(g)(6)	
Heel, Wood Turning Machines	.213(o)	
Helmets, See Hardhats		
Hoisting Equipment Ropes	.179(h)(2)	
Hooks	.179(b)(2)(i)	
Hoop, Drivers & Trussers	.214(q)	
Flaring & Expanding Machines	.214(v)	
Punching & Coiling Machines	.214(t)	
Hoses:		
Coupling, Flammable Liquids	.106(f)(4)	
Outlets, Water, Firefighting	.158(b)	
Oxygen & Fuel Gas	.252(b)(k)(v)	
Housekeeping:		
Crane Cabs	.179(o)(2)	
Materials Handling	.176(c)	
Passageways	.22(a)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Hydrogen	.103	
General	.103(a)	
Gaseous Hydrogen Systems	.103(b)	
Liquefied Hydrogen Systems	.103(c)	
Table H-1 (Distance for Location of Hydrogen System by Size)	.103	
Table H-2 (Minimum Distance for Location of Hydrogen System Regarding Any Specified Outdoor Exposure)	.103	
Table H-3 (Maximum Total Quantity of Liquefied Hydrogen Storage Permitted)	.103	
Table H-4 (Maximum Distance From Liquefied Hydrogen Systems to Exposure)	.103	
Testing Low Pressure Cylinders	.166(d)	
Hydrogen Systems, Gaseous	.103(b)	
Hydrogen Systems, Liquefied	.103(c)	
Ignition Sources	.108(e)	
Combustible Liquids	.106(f)	
Spray Finishing	.107(c)	
Illumination:		
Spray Booths	.107(b)(10)	
Pulpwood Plants	.261(c)(10)	
Incident Reporting Involving Radiation	.96(1)	
Industrial Disposal Systems	.143(a)	
Industrial Plants, Combustible & Flammable Liquids	.106(e)	
Industrial Trucks, Powered	.178	
Changing & Charging Batteries	.178(g)	
Control of Noxious Gases & Fumes	.178(i)	
Converted Industrial Trucks	.178(d)	
Designated Locations	.178(c)	
Designations	.178(b)	
Dockboards (Bridge Plates)	.178(j)	
Fuel Handling & Storage	.178(f)	
General Requirements	.178(a)	
Lighting for Operating Areas	.178(b)	
Loading	.178(c)	
Maintenance	.178(c)	
Noxious Gases & Fumes	.178(i)	
Operation	.178(p)	
Operator Training	.178(l)	
Safety Guards	.178(e)	
Table N-1 (Use of Industrial Trucks in Various Locations)	.178(c)(2)	
Traveling	.178(n)	
Truck Operations	.178(m)	
Insect Control, Labor Camps	.142(j)	
Inspection:		
Compressed Cylinders	.101(a)	
Cooperage Machinery	.214(w)	
Cranes—Crawler, Locomotive & Truck	.180(d)	
Derricks	.181(d)	
Overhead Gantry Crane	.179(j)	
Power Presses	.217(e)	
Rope, Overhead Gantry Crane	.179(m)	
Woodworking Machine	.213(s)	
Insulation:		
Mats	.137	
Resistance	.310(m)	
Interrupting Capacity, Overcurrent Protection	.312(b)	
Internal Combustion Engines	.110( )(1)	
Ionizing Radiation	.96	
Atomic Energy Commission Licensee	.96(p)	
Caution Signs, Labels & Signals	.96(e)	
Definitions	.96(a)	
Disclosure to Former Employee of Employee Record	.96(o)	
Exceptions for Radioactive Materials Packaged for Shipment	.96(h)	
Exposure to Radiation in Restricted Areas	.96(b)	
Exposure to Airborne Radioactive Materials	.96(c)	
Immediate Evacuation Warning Signals	.96(f)	
Instruction of Personnel Postings	.96(i)	
Notification of Incidents	.96(l)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Precautionary Procedures & Personal Monitoring	.96(d)	
Radiation Standards for Mining	.96(r)	
Records	.96(n)	
Reports of Overexposure & Excessive Levels & Concentrations	.96(m)	
Storage of Radioactive Materials	.96(j)	
Table G-17 (Neutron Flux Dose Equivalents)	.96	
Table G-18 (Rems Per Calendar Quarter)	.96	
Waste Disposal	.96(k)	
Jacks, Loading & Operation	.244(a)	
Terms	.241(d)	
Jointers	.213(j)	
Jointers Machine Stave	.214(g)	
Kitchens, Labor Camps:		
Construction & Operation	.142(i)	
Lighting	.142(g)	
Refuse Disposal	.142(h)	
Knots	.21(a)(14)	
Labor Camp Sites	.142(a)	
Labor Camps	.142	
Ladders, Fixed	.27	
Cages or Wells	.27(d)(1)	
Clearance	.27(c)	
Clearance Climbing Side	.27(c)(1)	
Clearance Hatch Covers	.27(c)(7)	
Clearance in Back	.27(c)(4)	
Clearance of Grab Bar	.27(c)( )	
Clearance With Cages	.27(c)(3)	
Clearance Without Cages	.27(c)(2)	
Clearance Step-Across Distance	.27(c)(6)	
Extensions	.27(d)(3)	
Figure D-1 (Suggested Design for Rungs on Individual Rung Ladders)	.27	
Figure D-2 (Minimum Ladder Clearance)	.27	
Figure D-3 (Clearance for Unavoidable Obstruction at Rear of Fixed Ladder)	.27	
Figure D-4 (Ladder Far from Wall)	.27	
Figure D-5 (Deflector Plates for Head Hazards)	.27	
Figure D-6 (Relationship of Fixed Ladder to a Safe Access Hatch)	.27	
Figure D-7 (Clearance Diagram for Fixed Ladder in Well)	.27	
Figure D-8 (Cages for Ladders more than 20 Feet High	.27	
Figure D-9 (Cages-Special Applications)	.27	
Figure D-10 (Offset Fixed Ladder Section)	.27	
Figure D-11 (Pitch of Fixed Ladders)	.27	
Landing Platforms	.27(d)(2)	
Maintenance	.27(f)	
Pitch	.27(e)	
Requirements	.27(d)	
Specific Features	.27(b)	
Table D-6 (Deflections)	.26	
Ladders, Metal Portable	.26	
Care	.26(c)	
Platforms	.26(a)(5)	
Requirements	.26(a)	
Stepladders	.26(a)(3)	
Straight Extension	.26(a)(2)	
Testing	.26(b)	
Trestles & Extension	.26(a)(4)	
Ladders, Wood Portable	.25	
Care	.25(d)	
Construction Requirements	.25(c)	
Material Requirements	.25(b)	
Requirements	.25(a)	
Table D-2 (Dimensions for Type I Step Ladders)	.25	
Table D-3 (Dimensions for Type II Step Ladders)	.25	
Table D-5 (Classification of Various Species of Wood Acceptable for Use in Ladders)	.25	
Ladders & Footwalks	.179(d)	
Ladders, Platform Guards	.23(a)(2)	
Ladders, Mobile Stands	.29(f)	
Landings	.68(b)(6)	
Lathes, Wood	.213(o)	
Laundries	.264	
Definitions	.264(a)	
General Requirements	.264(b)	
Guards, Point-of-Operation	.264(c)	
Moving Parts	.264(e)	
Operating Rules	264(d)	
Safety Standards	.264(f)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Laundry Facilities, Labor Camps	.142(f)	
Laundry Machinery & Operations	.264	
Lavatories	.141(d)(2)	
Lawnmower Power Guards	.243(e)	
Lead:		
Burning	.261	
Welding	.252	
Lifelines	.66(d)(8)	
Lifesaving Equipment:		
Logging	.265(d)	
Marine Operations	.28(u)(6)	
Lighting, Labor Camps	.142(g)	
Lighting, Industrial Trucks	.178(h)	
Liquefied Petroleum Gas Storage & Handling (see LP Gas)	.110	
Liquids, Flammable, Storage	.106(b)	
Liquids, Handling for Dip Tanks	.108(d)	
Basic Rules	.110(b)	
Cylinder Systems	.110(c)	
Definitions	.110(a)	
Liquefied Petroleum Gas as a Motor Fuel	.110(e)	
Liquefied Petroleum Gas Service Stations	.110(h)	
LP Gas Installations on Commercial Vehicles	.110(g)	
Storage of Containers Awaiting Use or Resale	.110(f)	
Systems Utilizing Containers Other Than DOT Containers	.110(d)	
Table H-23 (Minimum Distance Locations for Containers Regarding Building & Property Lines)	.110	
Table H-24 (Wall Thickness of Copper Tubing)	.110	
Table H-25 (Wall Thickness of Aluminum Alloy Tubing)	.110	
Table H-26 (Container & Vaporizer Safety Relief Valve Start-to-Discharge)	.110	
Table H-27 (Maximum Permitted Filling Density)	.110	
Table H-28 (LP Gas Classified Areas)	.110	
Table H-29 (Volume Correction Factors)	.110	
Table H-30 (LP Gas System Relief Valve Discharge limits)	.110	
Table H-31 (Storage of Container Design & Construction)	.110	
Table H-32 (Fuel Container Design Pressure & Classification)	.110	
Table H-33 (Outside Storage Locations for Containers)	.110	
Table H-34 (Design Pressure & Classification of Storage Containers)	.110	
Load Handling:		
Cranes	.180(h)	
Derricks	.181(i)	
Overhead Gantry Cranes	.179(n)	
Load Rating:		
Cranes, Locomotive, Crawler & Truck	.180(c)	
Derricks	.181(c)	
Loading, Industrial Trucks	.178(o)	
Looms	.262(b)(20)	
LP Gas:		
Basic Rules	.110(b)	
Container Storage	.110(f)	
Cylinder Systems	.110(c)	
Lunch Rooms	.141(g)	
Motor Fuels	.110(e)	
Service Stations	.110(h)	
Systems in Commercial Vehicles	.110(g)	
Longshoring	.16	
Lunchrooms	.141(g)	
Machinery, Abrasive Wheels	.215(a)	
Cooperage	.214	
Cooperage Maintenance	.214(w)	
Machinery & Machine Guarding:		
Abrasive Wheels	.215	
Cooperage	.214	
Definitions	.211	
Figure 0-1(Type 1 Straight Wheels)	.211(b)(1)	
Figure 0-2 (Type 2 Cylinder Wheels)	.211(b)(2)	
Figure 0-3 (Type 6 Straight Cup Wheels)	.211(b)(3)	
Figure 0-4 (Type 4 Flaring Cup Wheels)	.211(b)(4)	
Figure 0-5 (Type 6 & 11 Wheels (Terrazzo))	.211(b)(5)	
Forging Machines	.218	
General Requirements for all Machines	.212	
Mechanical Power Presses	.217	
Mechanical Power-Transmission Apparatus	.219	
Mills & Calenders in the Rubber & Plastic Industries	.216	
Woodworking Machinery Requirements	.213	

Subject Index for 29 CFR 1910—Occupational Safety and Health Standards—Continued

Subject Term	Section No.	Federal Register Page No.
Machines, Barrel Sanding	.214(p)	
Bilge Truss Hoop Ring Removing	.214(n)	
Boring, Mortising, & Woodworking	.213(l)	
Construction, Woodworking	.213(a)	
Crozing	.214(k)	
Forging	.218(a)	
Guarding	.212(a)	
Head Charring	.214(m)	
Head, Jointers	.214(s)	
Head Sanding	.214(r)	
Heading Bolt Sawing	.214(a)	
Heading, Rounder	.214(i)	
Heading Up	.214(l)	
Heel Turning	.213(o)	
Hoop Drivers & Trussers	.214(q)	
Hoop Elevators & Conveyors	.214(o)	
Hoop Flaring & Expanding	.214(v)	
Hoop Punching & Coiling	.214(t)	
Hoop Riveting	.214(u)	
Jointers	.213(j)	
Planer, Sticking, Matching	.213(n)	
Power Windlass	.214(j)	
Woodworking	.213(r)	
Machines, Sanding	.213(p)	
Stave Jointing	.214(g)	
Tenoning	.213(k)	
Veneer Cutters	.213(q)	
Veneer Wringers	.213(q)	
Wood Lathes	.213(o)	
Woodworking, Inspection, & Maintenance	.213(s)	
Wood Shapers	.213(m)	
Magazines	.109(a)(6)	
Maintenance:		
Building Repair, Exterior	.66(b)	
Cranes, Locomotive, Crawler & Truck	.180(b)	
Cranes, Overhead Gantry	.179(l)	
Derricks	.181(f)	
Dip Tanks	.108(f)	
Exits	.37(k)	
Industrial Trucks	.178(p)	
Power Presses	.217	
Power Transmission Apparatus	.219(p)	
Spray Finishing	.107(g)	
Woodworking Machines	.213(s)	
Manlift:		
Definition	.68(a)	
General Requirements	.68(b)	
Inspection	.68(e)	
Mechanical Requirements	.68(c)	
Operating Rules	.68(d)	
Manholes	.23(a)(6)	
Marine Service Stations	.106(g)(4)	
Markings:		
Fire Protection Equipment	.144(a)(1)(i)	
Physical Hazards	.144	
Matching Machines	.213(n)(1)	
Materials Approved for Guards	.219(o)	
Materials Handling and Storage	.176	
Clearance	.176(e)	
Crawler, Locomotive & Truck Cranes	.180	
Derricks	.181	
Drainage	.176(d)	
Handling	.176	
Indoor Storage	.177	
Overhead & Gantry Cranes	.179	
Personal Protection	.176(g)	
Powered Industrial Trucks	.178	
Storage	.176(b)	
Means of Egress	.35	
Application	.36(a)	
Access to Exits	.37(f)	
Alarm & Detection Systems, Fire	.37(n)	
Automatic Sprinkler Systems	.37(m)	
Capacity	.37(d)	
Construction Workers	.36(c)	
Change in Elevation	.37(j)	
Definitions	.35	

Subject Index for 29 CFR 1910—Occupational Safety and Health Standards—Continued

Subject Term	Section No.	Federal Register Page No.
Discharge from Exits	.37(h)	
Egress Capacity & Occupant Load	.37(d)	
Employee Protection	.36(c)	
Exit Components	.37(a)	
Exit Markings	.37(q)	
Exterior Ways To Exit Access	.37(g)	
Furnishings & Decorations	.37(l)	
Headroom	.37(i)	
Maintenance & Workmanship	.37(k)	
Permissible Exit Components	.37(a)	
Protective Enclosure of Exits	.37(b)	
Sources of Standards	.39	
Mechanical Equipment, Handling	.176(a)	
Mechanical Materials Handling Equipment	.177(e)	
Mechanical Power Transmission Apparatus	.219	
Medical Examinations, Asbestos	.93a(j)	
Medical Records, asbestos	.93a(h)(6)	
Medical Treatment	.151	
Metal Polishing, Platforms	.66(b)(1)(ii) .94(b)	
Mills & Calenders:		
Alarms	.216(g)	
Protected by Location	.216(d)	
Rubber & Plastics	.216(a)	
Safety Controls	.216(b)	
Stopping Limits	.216(f)	
Trips & Energizing Switches	.216(e)	
Mining Radiation Standards	.96(r)	
Mists	.93	
Mixers	.263(e)	
Mobile Tubular Welded Frame Scaffolds	.29(b)	
Bracing	.29(b)(2)	
Erection	.29(b)(5)	
Locking	.29(b)(4)	
Spacing	.29(b)(3)	
Mobile Ladder Stands	.29(f)	
Base width	.29(f)(2)	
Handrails	.29(f)(4)	
Loading	.29(f)(5)	
Steps	.29(f)(3)	
Mobile Ladders, Stands & Scaffolds (Towers), Manually Propelled	.29	
General Requirements	.29(a)	
Mobile Ladder stands	.29(f)	
Mobile Tube and Coupler Scaffolds	.29(d)	
Mobile Tubular Welded Frame Scaffolds	.29(b)	
Mobile Tubular Welded Sectional Folding Scaffolds	.29(c)	
Mobile Work Platforms	.29(e)	
Wheels or Casters	.29(a)(4)	
Work Levels	.29(a)(3)	
Working Loads	.29(a)(2)	
Mobile Tube and Coupler	.29(d)	
Design	.29(d)(1)	
Erection	.29(d)(3)	
Materials	.29(d)(2)	
Mobile Scaffolds, Tubular Welded	.29(c)	
Bracing	.29(c)(3)	
End Frames	.29(c)(6)	
Erection	.29(c)(7)	
Sectional Folding Ladder	.29(c)(5)	
Sectional Folding Ladder Stairway	.29(c)(4)	
Stairway	.29(c)(2)	
Mobile Work Platforms	.29(e)	
Base Width	.29(e)(2)	
Bracing	.29(e)(3)	
Molding Machines	.213(n)(1)	
Monitoring Ionizing Radiation	.96(d)	
Asbestos	.93a(f)	
Mortising Machines	.213(1)	
Motor Fuel LP Gas	.110(e)	
Moulders	.263(g)(1)	
National Consensus Standards	.2(g)	
Nitrous Oxide	.105	
Noise Exposure	.95	
Nonionizing Radiation	.97	
Electromagnetic Radiation	.97(a)	
Figure G-11 (Radio-Frequency Radiation Hazard Warning Symbol)	.97	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Nonwater Carriage Disposal Systems	.143	
Acceptable Industrial Disposal Systems	.143(a)	
Chemical Toilet Specifications	.143(c)	
Combination Toilets	.143(e)	
Portable Toilet Construction	.143(g)	
Privy Specifications	.143(b)	
Recirculating Toilet Specifications	.143(f)	
Seepage Pit Construction	.143(d)	
Nozzles:		
Abrasive Blasting	.244(b)	
Air Cleaning	.94(a)(2)(iii)	
Obstructions, Exit Access	.37(k)(2)	
Occupational Foot Protection	.136	
Occupational Head Protection	.135	
Occupational Health & Environmental Control:		
Additional Delay in Effective Date	.98	
Air Contaminants	.93	
Ionizing Radiation	.96	
Nonionizing Radiation	.97	
Occupational Noise Exposure	.95	
Sources of Standards	.99	
Standards Organizations	.100	
Ventilation	.94	
Occupational Noise Exposure	.95	
Table G-16 (Permissible Noise Explosives)	.95	
Oiling Facilities, Power Transmission	.219(j)	
Open Surface Tanks, Ventilation	.94(d)(3)	
Openers & Pickers	.262(b)(25)	
Openings, Wall Protection	.23(b)	
Opensided Floors, Protection	.23(c)	
Operations:		
Derricks	.181(h)	
Industrial Trucks	.178(m)	
Industrial Trucks, Training	.178(l)	
Power Presses	.217(f)	
Spray Finishing	.107(g)	
Welding & Cutting	.251(a)	
Organic Peroxides	.107(m)	
Outlets, Fire Hose	.158(b)	
Ovens	.263(l)	
Overhead Gantry Cranes	.179	
Brakes	.179(f)	
Cabs	.179(c)	
Definitions	.179(a)	
Electric Equipment	.179(g)	
Footwalks & Ladders	.179(d)	
General Requirements	.179(b)	
Handling Load	.179(n)	
Hoisting Equipment	.179(h)	
Inspection	.179(j)	
Maintenance	.179(l)	
Other Requirements	.179(o)	
Rope Inspection	.179(m)	
Stops, Bumpers, Rail Sweeps & Guards	.179(e)	
Testing	.179(k)	
Oxygen	.104	
Concentration, Dip Tank	.94(d)	
	.108	
Oxygen Systems, Bulk:		
Containers	.104(b)(4)	
Distance To Other Exposure	.104(b)(3)	
Location	.104(b)(2)	
Packages	.177(a)(7)	
Paints, Fire Retardant	.37(o)	
Paper Mills, Stock Preparation	.261(j)	
Bleaching	.261(h)	
Chemical Process	.261(g)	
Finishing Room	.261(l)	
General Regulation	.261(a)	
Handling & Storage Pulpwood	.261(c)	
Handling & Storage Raw Materials	.261(d)	
Machine Room	.261(k)	
Materials Handling	.261(m)	
Mechancial Pulp Process	.261(i)	
Preparing Pulpwood	.261(e)	
Rag & Old Paper Preparation	.261(f)	
Safe Practice	.261(b)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Passageways	.36	
	.22(b)	
Peroxides, Organic	.107(m)	
Personal Protective Equipment: (see Also Protection Equipment).		
Additional Delay in Effective Date	.138	
Application	.132(c)	
Asbestos	.93a(d)	
Electrical protective devices	.137	
Employees	.132(b)	
Eye and Face Protection	.133	
General Requirements	.132	
Occupational Foot Protection	.136	
Respiratory Protection	.134	
Sources of Standards	.141(a)(4)	
Pest Control	.141(a)(4)	
Petroleum Gases	.110	
Container Utilization	.110(d)	
Cylinder Systems	.110(c)	
Gas service Stations	.110(h)	
Motor Fuels	.110(e)	
Odorizing	.110(b)	
Resale Storage Containers	.110(f)	
Physical Hazards, Color Codes	.144	
Piling, Materials Handling	.176(a)	
Indoor Storage	.177(c)	
Pipeline, Transmission, Welding	.252(g)	
Piping Systems, Mechanical, Welding	.252(g)(2)	
Planers	.213(n)	
Stave & Heading	.214(f)	
Platers	.261(1)(8)	
Platforms, Power:		
Definitions	.66(a)	
General Requirements	.66(b)	
Inspection & Test	.66(e)	
Protection of Open-Sided Floors	.23(c)	
Type F	.66(c)	
Type T	.66(d)	
Pneumatic Tool Guards	.243(b)	
Point of Operation, Safeguarding	.217(c)	
Polishing, Ventilation	.94(b)	
Portable Fire Extinguishers	.157	
Distribution	.157(c)	
General Requirements	.157(a)	
Inspection, Maintenance & Hydrostatic Tests	.157(d)	
Selection	.157(c)	
Portable Metal Ladders	.26	
Care, Maintenance & Use	.26(c)	
Requirements	.26(a)	
Testing	.26(b)	
Portable Tools and Equipment	.244	
Abrasive Blast Cleaning Nozzles	.244(b)	
Jacks	.244(a)	
Portable Tools, Woodworking Guard	.243(a)	
Figure P-1 (Type 11—Flaring-Cup Wheel)	.241	
Figure P-2 (Type 6—Straight-Cup Wheel)	.241	
Figure P-3 (Type 1—Straight-Wheel)	.241	
Figure P-4 (Vertical Portable Grinder Safety Guard)	.243	
Figure P-5 (Maximum Angular Exposure for Other Portable Grinders)	.243	
Figure P-6 (Maximum Angular Exposure for Other Portable Grinders)	.243	
Power Tools	.241	
Table P-1 (Identification of Cased Loads)	.243	
Portable Wood Ladders	.25	
Application of Requirements	.25(a)	
Care & Use	.25(d)	
Construction Requirements	.25(c)	
Materials	.25(b)	
Potable Water	.141(b)(1)	
Power Coatings, Spray Finishing	.107(l)	
Power Platforms for Exterior Building Maintenance	.66	
Definitions	.66(a)	
General Requirements	.66(b)	
Inspections & tests	.66(e)	
Type F	.66(c)	
Type T	.66(d)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Power Transmission Apparatus, Mechanical	.219	
Approved Materials	.219(o)	
Belts Ropes & Chain Drives	.219(e)	
Belts, Shifters, Clutches, Shippers, Poles, Perchers & Fasteners	.219(l)	
Care	.219(p)	
Collars & Couplings	.219(e)	
Disks, Shields & "U" Guards	.219(n)	
Gears, Sprockets & Chains	.219(f)	
General Requirements	.219(a)	
Guarding Friction Drives	.219(g)	
Guarding Clutches, Cut-off Couplings & Clutch Pulleys	.219(k)	
Keys, Setscrews & Other Projections	.219(h)	
Prime-mover Guards	.219(b)	
Pulleys	.219(d)	
Shafting	.219(c)	
Table 0-12 (Table of Standard Materials & Dimensions)	.219	
Table 0-13 (Horizontal Overhead Belts, Ropes & Chains 7 Feet or More Above Floor or Platform)	.219	
Power Windlass Machine	.214(j)	
Press Guarding	.217(b)	
Presses:		
Forging	.218(f)(1)	
Inspection & Maintenance	.217(e)	
Operation	.217(f)	
Terms	.211(d)	
Trimming	.218(d)	
Presses Power, Mechanical	.217	
Design, Construction, Setting & Feeding of Dies	.217(d)	
General Requirements	.217(a)	
Inspection, Maintenance & Modification	.217(e)	
Mechanical Power Press Guarding & Construction	.217(b)	
Operation of	.217(f)	
Safeguarding Point of Operation	.217(c)	
Pressure Vessels	106(b)(1)	
Air Receivers	.169(a)(2)	
Prime-Mover, Guards (Flywheels)	.219(b)	
Privy, Specifications	.143(b)	
Protection Equipment: See also Personal Protective Equipment)		
Acid & Chemical Tanks	.94(d)(9)(v)	
Design	.132(c)	
Electrical Shock	.137	
Employee-owned	.132(b)	
Employer Furnished	.133	
Eye	.133	
Foot	.136	
Foot, Shoes (Blasting)	.94(a)(5)(v)	
General Requirements	.132	
Gloves, Aprons	.94(a)(5)(v)	
Head	.135	
Open Surface Tank	.94(d)(11)	
Personal (Welding)	.252(a)(iv)	
Radiation	.96	
Electromagnetic	.97	
Ionizing	.96	
Respirators	.94(a)(5)(ii)	
Respiratory Protection	.134	
Wet Environment	.94(d)(9)(iv)	
Pulleys, Power Transmission	.219(d)	
Pulp, Paper & Paperboard Mills	.261	
Pulpwood, Logging	.266	
Definitions	.266(b)	
Equipment Protection Devices	.266(d)	
General Regulation	.266(a)	
Handtools	.266(c)(2)	
Harvesting	.266(e)	
Personal Protective Devices	.266(c)(1)	
Pumps, Loading	.106(f)(4)(vi)	
Radial Saws	.213(h)	
Radiation:		
Areas, Posting Instructions	.96(i)	
Caution Signs	.96(e)	
Employee Records, Disclosure	.96(o)	
Evacuation Signal	.96(f)	
Exceptions	.96(g)	
Exposure	.96(c)	
Hazards, Procedures Precautionary	.96(d)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Incident Notification	.96(l)	
Ionizing	.96(a)	
Nonionizing	.97	
Packaging & Marking Exemptions	.96(h)	
Personnel Monitoring	.96(d)	
Records	.96(n)	
Reports of Overexposure	.96(m)	
Reports of Excessive Levels	.96(m)	
Restricted Areas	.96(b)	
Standards for Mining	.96(r)	
Storage	.96(j)	
Waste	.96(k)	
Rail Sweeps, Cranes, Overhead Gantry	.179(e)	
Railings	.24(h)	
Stair	.24(h)	
Toeboard	.23(b)(1)	
Railroad Cars, Industrial Trucks In	.178(k)	
Railroad Cars, Rolling	.176(f)	
Railroad Cars, Stops, Positive Braking	.178(m)(7)	
Radioactive:		
Materials Exposure	.96(c)	
Materials, Incident Modification	.96(l)	
Materials, Packaging & Exemptions	.96(h)	
Materials, Report of Excessive Levels of Concentration	.96(m)	
Materials, Report of Overexposure	.96(m)	
Radioactive Materials Waste	.96(k)	
Ramps:		
Enclosures	.23(c)(1)	
Exits	.37(j)	
Records, Ionizing Radiation	.96(n)	
Refineries	.106(i)	
Refuse Disposal, Labor Camps	.142(h)	
Regulators	.252(b)(6)	
Relay:		
Direction	.66(a)(18)	
Potential for Vertical Travel	.66(a)(19)	
Repair Operations, Means of Egress	.36(c)	
Reporting Communicable Diseases	.142(l)	
Respirators:		
Air Quality	.134(d)	
Care & Maintenance	.134(f)	
Identification of Gas Mask Canisters	.134(g)	
Limits	.94(a)(5)(ii)	
Minimal Program Acceptable	.134(b)	
Program, Asbestos	.93a(d)(iv)	
Protection	.134(a)	
Selection	.134(c)	
Table I-1 (Gas Mask Canister Color Markings)	.134	
Rest Rooms, Women	.141(f)	
Rewinders	.261(l)(8)	
Ripsaw, Hand-Fed	.213(c)	
Cooperage machinery	.214(d)	
Rodent Control, Labor Camps	.142(j)	
Rollers:		
Building Face	.66(a)(7)	
Guide	.66(a)(12)	
Roof Car	.66(c)(ii)	
Rope Guards, Overhead Gantry Cranes	.179(e)(5)	
Rope Inspection:		
Cranes, Crawler & Truck	.179(d)(3)	
Derricks	.181(g)	
Overhead Cranes	.179(m)	
Rope Rated Load	.66(a)(17)	
Tag Date	.66(c)(21)	
Rotary:		
Cutters	.261(f)(2)	
Guarding	.219(a)	
Rubber Gloves, Blankets	.137	
Rubber Protective Equipment, Electrical Shock	.137	
Runways Protection Platforms	.23(c)	
Rust Removers, Chemical	.94(d)(1)	
Safety:		
Color Code	.144	
Controls, calenders	.216(c)	
Controls, mills	.216(b)	
Equipment Modification & Procurement	.132	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Glasses	.251	
Guards, Industrial Trucks	.178(e)	
Relief Devices, Cargo & Portable Compressed Gas Tanks	.167(a)	
Shoes	.134	
Sand Blast Nozzles	.244(b)	
Sand Blasting	.94	
Sanding Machines	.213(p)	
Sanitation:		
Dressing Rooms	.141(e)	
Food Handling	.141(h)	
General	.141(a)	
Lunch Rooms	.141(g)	
Retiring Rooms for Women	.141(f)	
Rest Rooms	.141(d)(2)	
Toilet Facilities	.141(c)	
Washing Facilities	.141(d)	
Water Supply	.141(b)	
Saws:		
Band	.213(i)	
Barrel Stave	.214(c)	
Bolt Equalizer, Stage & Heading	.214(b)	
Circular	.213(e)	
Crosscut, hand-fed	.213(d)	
Cutoff, Swing	.213(g)	
Forge facility	.218(j)(2)	
Mills	.265	
Radial	.213(h)	
Ripsaws	.213(c)	
Swing	.213(g)	
Sawmills:		
Building Facilities & Equipment	.265(c)	
Definitions	.265(b)	
Dry kilns	.265(f)	
Fire Protection	.265(i)	
General	.265	
Log Breakdown & Machinery	.265(e)	
Personal Protective Equipment	.265(g)	
Sanitation Requirements	.265(h)	
Scaffolds:		
Boatswain's Chair	.28(j)	
Fiber Rope	.28(j)(2)	
Roof Irons, Hooks	.28(j)(6)	
Seat Slings	.28(j)(3)	
Size Requirements	.28(j)(1)	
Space Requirements	.28(k)(4)	
Tackle Requirements	.28(j)(5)	
Workmen Protection	.28(j)(4)	
Bricklayer's Square	.28(l)	
Height Requirements	.28(l)(6)	
Level	.28(l)(7)	
Platform Planks	.29(l)(5)	
Reinforcement	.28(l)(3)	
Size Requirements	.28(l)(1)	
Space Requirements	.28(b)(4)	
Square Requirements	.28(l)(4)	
Carpenter's Bracket	.28(k)	
Bracket Attachment	.28(k)(2)	
Bracket Dimensions	.28(k)(1)	
Guardrails	.28(k)(5)	
Platform Size	.28(k)(4)	
Workmen Protection	.28(k)(3)	
Crawling Board or Chicken Ladders	.28(t)	
Construction	.28(t)(1)	
Life-Line	.28(t)(2)	
Float or Ship	.28(u)	
Construction	.28(u)(1)	
Platform Dimensions	.28(u)(2)	
Under Platform	.28(u)(3)	
Wood Dimensions	.28(u)(4)	
Workmen	.28(u)(1)	
General Requirements:		
Access Ladder	.28(a)(12)	
Components	.28(a)	
Damaged or Weakened	.28(a)(6)	
Debris & Trash	.28(a)(20)	
Footing or Anchorage	.28(a)(2)	
Fiber Rope	.28(a)(21)	
Guardrails & Toeboards	.28(a)(3)	
Load Carrying Timber	.28(a)(8)	
Diagonal Bracing	.28(b)(8)	
Materials Hoisting	.28(a)(15)	
Nails & Bolts	.28(a)(10)	
Needle Beam, Iron Workers	.28(a)(3)(ii)	
Overhead Protection	.28(a)(16)	
Planking Extend Requirements	.28(a)(13)	
Planking of Platforms Overlapping	.28(a)(11)	
Planking, Wood Type	.28(a)(9)	
Poles, Legs or Uprights	.28(a)(14)	
Securing	.28(b)(4)	
Securing with Bolts	.28(a)(26)	
Shore & Lean-to's	.28(a)(24)	
Table D-7 (Minimum Nominal Size & Maximum Spacing of Members of Single Pole Scaffolds (Light Duty))	.28	
Table D-8 (Minimum Nominal Size & Maximum Spacing of Members of Single Pole Scaffolds (Medium Duty))	.28	
Table D-9 (Minimum Nominal Size & Maximum Spacing of Members of Single Pole Scaffold (Heavy Duty))	.28	
Table D-10 (Minimum Nominal Size & Maximum Spacing of Members of Independent Pole Scaffolds (Light Duty))	.28	
Table D-11 (Minimum Nominal Size & Maximum Spacing of Members of Independent Pole Scaffolds (Medium Duty))	.28	
Table D-12 (Minimum Nominal Size & Maximum Spacing of Members of Independent Pole Scaffolds (Heavy Duty))	.28	
Table D-13 (Tube & Coupler Scaffolds (Light Duty))	.28	
Table D-14 (Tube & Coupler Scaffolds (Medium Duty))	.28	
Table D-15 (Tube & Coupler Scaffold (Heavy Duty))	.28	
Table D-16 (Minimum Nominal Size & Maximum Spacing of Members of Outrigger Scaffolds)	.28	
Table D-17 (Schedule for Ladder-Type Platforms)	.28	
Table D-18 (Minimum Dimensions for Bricklayer's Square Scaffold Members)	.28	
Table D-19 (Minimum Dimensions for Horse Scaffold Members)	.28	
Weather Working Conditions	.28(a)(18) & (19)	
Wire Ropes	.28(a)(22)	
Horse:		
Cross Bracing	.28(m)(5)	
Guardrails	.28(m)(7)	
Height Requirements	.28(m)(1)	
Quantity	.28(m)(2)	
Spacing	.28(m)(3)	
Interior Hung:		
Guardrails	.28(p)(7)	
Hang Wood	.28(p)(3)	
Overhead Supports	.28(p)(6)	
Planking	.28(p)(3)(ii)	
Steel Tube & Coupler Members	.28(p)(4)	
Steel Wire Rope	.28(p)(2)	
Supported by Wire Rope	.28(p)(5)	
Supporting Beams	.28(p)(6)	
Ladder Jack:		
Construction	.28(q)(3)	
Heavy Duty	.28(q)(2)	
Limited Duty	.28(q)(1)	
Platform Planks	.28(q)(5)	
Workmen, Maximum	.28(q)(6)	
Mason's Adjustable Multiple Point Suspension	.28(f)	
Beams, Structure & Strength	.28(f)(4)(5)	
Channel Iron Outrigger Beams	.28(f)(7)	
Guardrails	.28(f)(15)	
Hoist-Machines	.28(f)(2)	
Installation	.28(f)(17)	
Load Requirements	.28(f)(1)	
Maintenance of Bolts, Fittings & Clamps	.28(f)(11)	
Overhang	.28(f)(6)	
Overhead Protection	.28(f)(16)	
Platform Strength	.28(f)(14)	
Platform Supports	.28(f)(3)	
Single Outrigger Beams	.28(f)(13)	
Stop Bolts	.28(f)(9)	
Suspension Wire Ropes	.28(f)(12)	
Webs	.28(f)(8)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Needle Beam	.28(n)	
Beam Requirements	.28(n)(1)	
Platform Span	.28(n)(4)	
Rope Attachments	.28(n)(3)	
Rope & Hangers	.28(n)(2)	
Supports	.28(n)(7)	
Tools	.28(n)(6)	
Work Surfaces	.28(n)(8)	
Outrigger	.28(e)	
Addition Level Requirements	.28(e)(6)	
Beams	.28(e)(1)	
Drawing & Specifications on Site	.28(e)(3)	
Falling Material	.28(e)(5)	
Inboard Ends	.28(e)(2)	
Planking	.28(e)(4)	
Plasters, Decorators & Large Area	.28(o)	
Construction Requirements	.28(o)(1)	
Guardrails	.28(o)(2)	
Platform Planks	.28(o)(3)	
Roofing Brackets	.28(s)	
Catch Platforms	.28(s)(3)	
Construction	.28(s)(1)	
Single-Point Adjustable Suspension	.28(i)	
Emergency Brakes	.28(i)(4)	
Equipment	.28(i)(7)	
Gears & Brakes	.28(i)(3)	
Guards, Mid-Rails & Toeboards	.28(i)(5)	
Hoisting Machines	.28(i)(6)	
Power Units	.28(i) (1) & (2)	
Supporting Cables	.28(i)(8)	
Suspension Methods	.28(i)(10)	
Stone Setter Adjustable Multiple-Point Suspension	.28(h)	
Bridging Scaffolds	.28(h)(9)	
Guardrails	.28(h)(8)	
Hoisting Machines	.28(h)(2)	
Installation	.28(h)(10)	
Outriggers	.28(h)(5)	
Platforms	.28(h)(3)	
Supports	.28(h)(6)	
Suspension Materials	.28(h)(4)	
Suspension Wire Ropes	.28(h)(7)	
Working Loads	.28(h)(1)	
Tube & Coupler	.28(c)	
Bearers	.28(c)(9)	
Construction Requirements	.28(c)(5)	
Heavy-duty	.28(c)(3)	
Light-duty	.28(c)(1)	
Medium-duty	.28(c)(2)	
Runners	.28(c)(8)	
Tubular Welded Frame	.28(d)	
Bracing	.28(d)(3)	
Drawing & Specification Requirements	.28(d)(11)	
Erection Requirements	.28(d)(12)	
Frames	.28(d)(5)	
Frames & Accessories Maintenance	.28(d)(13)	
Guardrails	.28(d)(7)	
Inspections	.28(d)(14)	
Leg Requirements	.28(d)(4)	
Load Requirements	.28(d)(8)	
Metal Tubular Frame	.28(d)(1)	
Planking	.28(d)(10)	
Securing	.28(d)(9)	
Spacing of Panels	.28(d)(2)	
Uplift	.28(d)(6)	
Two-Point Suspension (Swinging)	.28(g)	
Acid Solutions	.28(g)(10)	
Beams	.28(g)(12)(iii)	
Blocks	.28(g)(7)	
Guardrails	.28(g)(5)	
Hangers	.28(g)(2)	
Hoisting Machines	.28(g)(3)	
Plank-Type	.28(g)(12)(ii)	
Roof Irons or Hooks	.28(g)(4)	
Ropes, Slings, Hangers & Platforms	.28(g)(8)	
Securing	.28(g)(11)	
Side String	.28(g)(12)(i)	
Suspension	.28(g)(6)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Window Jack	.28(r)	
Guardrails	.28(r)(3)	
Use	.28(r)(1)	
Scaffolding, Wood:		
Cross Bracing	.28(b)(9)	
Diagonal Bracing	.28(b)(8)	
Full Diagonal Face Bracing	.28(b)(10)	
Guardrails	.28(b)(15)	
Ledgers	.28(b)(7)	
Moving Platform to Next Level	.28(b)(14)	
Platform Planks	.28(b)(11) & (12)	
Platform Turns (Planking)	.28(b)(13)	
Pole Load Requirements	.28(b)(1)	
Pole Secure Requirements	.28(b)(4)	
Pole Scaffold 60' or less	.28(b)(16)	
Putlogs or Bearers	.28(b)(5) & (6)	
Spliced Wood Poles	.28(b)(2)	
Wood	.28(b)	
Seepage Pit	.143(d)	
Services, Medical	.151(a)	
Service Stations, Combustible & Flammable Liquids	.106(g)	
Service Stations, LP Gas	.110(h)	
Sewage Disposal, Labor Camps	.142(e)	
Sewing Machines	.264(a)(14)	
Shackles	.179(e)(46)	
Shafting, Power Transmission	.219(c)	
Shaper, Wood	.213(m)	
Shearing Machines	.217	
Shelters, Labor Camps	.142(b)	
Shipbreaking	.15	
Shipbuilding	.14(a)	
Ship Repairing	.13(a)	
Shredders	.261(f)(2)	
Signs:		
Accident Prevention	.145	
Caution, Radioactive Material	.96(e)(1)	
Classification-danger, Caution, Safety	.145(c)	
Color Code	.144(a)	
Design & Color	.145(d)	
Figure J-1 (Danger Sign)	.145	
Figure J-2 (Radiation Warning Sign)	.145	
Figure J-3 (Standard Radiation Symbol)	.145	
Figure J-4 (Caution Sign)	.145	
Figure J-5 (Safety Instruction Signs)	.145	
Figure J-6 (Directional Signs)	.145	
Figure J-7 (Slow Moving Vehicle Emblem)	.145	
Figure J-8 (Symbols Used on Signs)	.145	
Figure J-9 (Symbol Used for Biological Hazard)	.145	
Figure J-10 (Do Not Start Tag)	.145	
Figure J-11 (Danger Tag)	.145	
Figure J-12 (Caution Tag)	.145	
Figure J-13 (Out of Order Tag)	.145	
Figure J-14 (Radiation Tag)	.145	
Figure J-15 (Biological Hazard Tag)	.145	
Table J-1 (Standard Proportions for Danger Signs)	.145	
Table J-2 (Standard Proportions for Caution Signs)	.145	
Table J-3 (Standard Proportions for Safety Instruction Signs)	.145	
Table J-4 (Standard Proportions for Directional Signs)	.145	
Wording	.145(e)	
Slicers	.263(p)(1)	
Slings	.264(c)(24)(iv)	
Smoking, Indoor Storage	.177(g)	
Sound Level Meter	.95(a)	
Special Industries:		
Agricultural Operations	.267	
Bakery Equipment	.263	
Laundry Machinery & Operations	.264	
Pulp, Paper & Paperboard Mills	.261	
Pulpwood Logging	.266	
Sawmills	.265	
Textiles	.262	
Spray Booths	.107(a)(3)	
Sprinklers	.107(f)	
Spray Finishing	.94(c)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Spray Finishing Using Flammable & Combustible Materials	.107	
Automobile Undercoating in Garages	.107(k)	
Definitions	.107(a)	
Drying, Curing or Fusion Apparatus	.107(j)	
Electrical and Other Sources of Ignition	.107(c)	
Electrostatic Hand Spraying Equipment	.107(i)	
Fixed Electrostatic Apparatus	.107(h)	
Operations and Maintenance	.107(g)	
Organic Peroxides & Dual Component Coatings	.107(m)	
Powder Coatings	.107(l)	
Protection	.107(f)	
Spray Booths	.107(b)	
Storage	.107(e)	
Ventilation	.107(d)	
Sprinkler System	.159	
Alarms	.159(c)	
Automatic	.159, .37(m)	
Drains	.159(c)(3)	
Fire Department Connection	.159(a)(3)	
Maintenance	.159(d), .37(m)	
Spray booths	.107(b)	
Support	.159(b)(3)	
Valves	.159(b)(2)	
Waterflow Detecting Devices	.159(c)(2)	
Water Supply	.159(a)(2)	
Sprockets & Chains	.219(f)	
Stairs, Fixed Industrial	.24	
Length	.24(g)	
Open Risers	.24(j)	
Required	.24(b)	
Rise	.24(e)	
Strength	.24(c)	
Table D-1 (Angle of Stairway Rise)	.24	
Treads	.24(f)	
Vertical Clearance	.24(i)	
Width	.24(d)	
Stairway Guarding	.23(d)	
Standards Organizations	.40	
Standards Sources:		
Compressed Gas & Compressed Air Equipment	.170	
General Environment Controls	.147	
Hand & Portable Powered Tools & Other Hand-Held Equipment	.246	
Hazardous Materials	.115	
Machinery & Machine Guarding	.221	
Materials Handling & Storage	.183	
Occupational Health & Environmental Control	.99	
Personal Protective Equipment	.139	
Powered Platforms, Manlifts & Vehicle-Mounted Work Platforms	.69	
Walking-Working Surfaces	.31	
Welding, Cutting & Brazing	.253	
Standpipe & Hose Systems	.158	
General Requirements	.158(a)	
Hose Outlets	.158(b)	
Water Supplies	.158'(c)	
Tests & Maintenance	.158(d)	
Standpipes (Fire Protection):		
Connection	.158(b)(2)	
Dry Identification	.158(b)(7)	
Inspection	.158(d)(2)	
Installation	.158(c)(4)	
Protection	.158(a)(3)	
Supply	.158(c)(3)	
Test & Maintenance	.158(d)(1)	
Stave, Equalizer Saw, Self-Feed	.214(c)	
Stave & Heading Planers	.214(f)	
Stave Jointing Machines	.214(g)	
Steam Vat (Veneer)	.30(c)	
Sticking Machines	.213(n)	
Stops, Rails, Overhead Gantry Cranes	.179(e)	
Storage:		
Ammonium Nitrate	.109(i)	
Anhydrous Ammonia	.111(a)(1)	
Batteries, Industrial Trucks	.178(g)	
Blasting Agents	.109(g)	
Compressed Gases	.101(b)	
Explosives	.109(c)	
Fire protection	.177(d)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
	.106(d)	
Flammable & Combustible Liquids	.107(e)	
Flammable Liquids	.108(d)	
Flammable Liquids, Dip Tank	.177(a)	
Indoor, Definition	.177(a)	
Indoor, General	.177(d)	
Indoor, No Fire Protection	.106(f)	
Liquids, Classes I, II, & III	.110(f)	
LPG, Containers	.110(a)	
LPG, Definition	.177(e)	
Mechanical Handling Equipment, Indoor	.177(c)	
Piling, Indoor	.96(j)	
Radioactive Materials	.111(d)	
Refrigerated Storage Systems	.177(f)	
Service Equipment Indoor Buildings	.177(g)	
Smoking Indoors	.106(b)	
Tanks	.145(f)	
Tags, Accident Prevention	.106(d)	
Tanks, Portable Storage	.168	
Compressed Gas	.106(b)	
Combustibles	.213(k)	
Tenoning Machines		
Textiles:	.262(a)	
Application Requirements	.262(nn)	
Acid Carboys	.262(p)	
Bleaching	.262(ee)	
Calenders	.262(oo)	
Caustic Solutions	.262(gg)	
Clothing Folding Machines	.262(kk)	
Color Mixing	.262(e)	
Cotton Cards	.262(jj)	
Cuttle or Swing Folders	.262(b)	
Definitions	.262(u)	
Dying Jigs	.262(y)	
Extractors	.262(pp)	
First Aid	.262(x)	
Flat-work Ironers	.262(f)	
Garnet Machines	.262(k)	
Gill Boxes	.262(hh)	
Hand Bailing Machines	.262(cc)	
Laundry Washers	.262(n)	
Looms	.262(z)	
Nip Guards	.262(d)	
Openers & Pickers	.262(v)	
Padders	.262(k)(l)	
Pin Guards	.262(dd)	
Printing Machines	.262(qq)	
Protective Equipment	.262(ii)	
Rollbenches	.262(bb)	
Rope Washers	.262(ff)	
Rotary Staple Cutters	.262(c)	
Safety Requirements	.262(aa)	
Sanforizing & Palmer	.262(o)	
Shearing Machines	.262(g)	
Silver & Ribbon Lappers	.262(h)	
Slashers	.262(g)	
Spinning Mules	.262	
Table R-1 (Guard Openings)	.262(t)	
Tenter Frames	.262(i)	
Warpers	.262(rr)	
Work Rooms	.23(e)	
Toe Boards		
Toilet Rooms:	.143(a)(3)	
Chemical	.143(e)	
Combustion	.141(c)(2)	
Construction	.141(c)	
Facilities	.142(d)	
Labor Camps	.143(g)	
Portable	.143(f)	
Recirculating	.241	
Tools, Hand & Portable (Power)	.242(a)	
Employees Furnished	.109(d)	
Transportation, Explosives	.218(g)	
Trimming, Presses		
Trucks:	.178(g)	
Changing & Charging Batteries	.178(d)	
Converted	.178(b)	
Designations		

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Fuel Handling & Storage	.178(f)	
High Lift, Safety Guards	.178(e)	
Industrial	.178(a)	
Lighting	.178(h)	
Loading	.178(o)	
Maintenance	.178(q)	
Noxious Gases & Fumes	.178(i)	
Operation	.178(m)&(p)	
Operator Training	.178(l)	
Railroad Cars	.178(k)	
Undercoating Automobiles	.107(k)	
Upsetters	.218(h)	
Valves, Filling Tanks (liquids)	.106(f)(3)(iii)	
Vapors	.93 .106(e)(3)(v)	
Vats, Steam	.30(c)(4)	
Vehicle Mounted Work Platforms	.67	
General Requirements	.67(b)	
Vehicles, Commercial LPG	.110(g)	
Veneer Cutters & Wringers	.213(Q)	
Veneer Machinery	.30(c)	
Ventilation: (see Exhaust Systems)		
Abrasive Blasting	.94(a)	
Air Contaminants	.93.	
Asbestos	.93a(c)(ii)	
Dip Tank	.108(c)	
Figure G-1 (Vertical Spindle Grinder Exhaust Hood & Branch Pipe Connection)	.94	
Figure G-2 (Standard Grinder Hood)	.94	
Figure G-3 (A method of Applying an Exhaust Enclosure to Swing-Frame Grinders)	.94	
Figure G-4 (Standard Buffing & Polishing Hood)	.94	
Figure G-5 (Cradle Polishing or Grinder Enclosure)	.94	
Figure G-6 (Horizontal Single-Spindle Disc Grinder Exhaust Hood & Branch Pipe Connections)	.94	
Figure G-7 (Horizontal Double-Spindle Disc Grinder Exhaust Hood & Branch Pipe Connections)	.94	
Figure G-8 (A Typical Hood for a Belt Operation)	.94	
Grinders	.94(b)	
Open Surface Tanks	.94(d)	
Spray Finishing	.107(d) .94(c)(5)	
Spray Finishing Airflow Requirements	.94(c)(6)	
Spray Finishing Make-up Air	.94(c)(7)	
Table G-4 (Grinding Wheels & Abrasive Cutting-Off Wheels)	.94	
Table G-5 (Buffing & Polishing Wheels)	.94	
Table G-6 (Horizontal Single-Spindle Disc Grinder)	.94	
Table G-7 (Horizontal Double-Spindle Disc Grinder)	.94	
Table G-8 (Vertical Spindle Disc Grinder)	.94	
Table G-9 (Grinding and Polishing Belts)	.94	
Table G-10 (Minimum Maintained Velocities Into Spray Booths)	.94	
Table G-11 (Lower Explosive Limit of Some Commonly Used Solvents)	.94	
Table G-12 (Determination of Hazard Potential)	.94	
Table G-13 (Determination of Rate of Gas, Vapor or Mist Evolution)	.94	
Table G-14 (Control Velocities in Feet Per Minute for Undisturbed Locations)	.94	
Table G-15 (Minimum Ventilation Rate in Cubic Feet of Air Per Minute Per Square Foot of Tank Area for Lateral Exhaust)	.94	
Welding, Cutting, Brazing	.252(f)	
Venting Explosions	.94(a)(2)(iii)	
Walking-Working Surfaces:		
Definitions	.21	
Fixed Industrial Stairs	.24	
Fixed Ladders	.27	
General Requirements	.22	
Guarding Floor & Wall Openings & Holes	.23	
Manually Propelled Mobile Ladder Stands & Scaffolds (Towers)	.29	
Portable Metal Ladders	.26	
Portable Wood Ladders	.25	
Safety Requirements for Scaffolding	.28	
Wall Openings, Hole Protection, Barrier	.23(b)(i)	
Warning Devices Overhead Gantry, Warning Signs (see signs)	.179(i)	
Washing Facilities	.141(d)	
Hand	.142(f)	
Waste Disposal, Nonwater	.143(a)	
Waste Disposal, Radioactive Materials	.96(k)	
Waste, Flammable Liquids	.106(h)(8)(iii)	

SUBJECT INDEX FOR 29 CFR 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS—Continued

Subject Term	Section No.	Federal Register Page No.
Water Gel, Explosives	.109(h)	
Water Supply:		
Fire Protection	.158(c)	
Labor Camps	.142(c)	
Sanitation	.141(b)	
Sprinkler Systems	.159(a)(2)	
Weather:		
Power Platforms (Types F & T)	.66(b)(5)(i)	
Weatherproofing	.66(a)(24)	
Welding:		
Arc	.252(b)	
Cutting & Brazing	.251(a)	
Equipment	.252(c)	
Figure Q-1-Fuel-Gas & Oxygen Piping System Protective Equipment)	.252	
Figure Q-2 (Fuel-Gas & Oxygen Piping System Protective Equipment)	.252	
Figure Q-3 (Fuel-Gas & Oxygen Piping System Protective Equipment)	.252	
Figure Q-4 (Medium-Pressure Protective Device)	.252	
Fire Protection	.252(d)	
Operations	.251(a)	
Oxygen, Fuel, Gas System	.252(a)	
Personnel Protection	.252(e)	
Transmission, Pipeline	.252(g)	
Ventilation	.252(f)	
Welding, Cutting, and Brazing	.252	
Application, Installation & Operation	.252	
Arc Welding & Cutting Equipment	.252(b)(2)	
Equipment	.252(c)	
Fire Prevention & Protection	.252(d)	
Health Protection & Ventilation	.252(f)	
Industrial Applications	.252(g)	
Installation & Operation of Oxygen-Fuel Gas	.252	
Personnel Protection	.252(e)	
Window, Cleaning, Powered Platforms	.66(b)(1)(ii)	
Wire Rope	.180(34)	
	.265(c)(24)	
Women's Sanitation Facilities	.141(f)	
Wood Heel Turning Machines	.213(o)	
Woodworking Machinery Requirements	.213	
Band Saws & Resaws	.213(i)	
Boring & Mortising Machines	.213(l)	
Circular Resaws	.213(e)	
Hand-fed Ripsaws	.213(c)	
Hand-fed Crosscut Table Saws	.213(d)	
Inspection & Maintenance of Woodworking Machinery	.213(s)	
Jointers	.213(j)	
Machine Controls & Equipment	.213(b)	
Machinery Construction	.213(a)	
Portable	.243	
Planing, Molding, Sticking & Matching Machines	.213(n)	
Profile, Swing-Head Lathes & Wood Head Heel Turning Machines	.213(o)	
Radial Saws	.213(h)	
Sanding Machines	.213(p)	
Self-fed Circular Saws	.213(f)	
Swing Cutoff Saws	.213(g)	
Tenoning Machines	.213(k)	
Veneer Cutters & Wringers	.213(q)	
Woodshapers & Similar Equipment	.213(m)	
Woodworking Machines	.213(r)	
Working Load, Defined	.29(a)(2)	
Working Surfaces:		
Aisles	.22(b)	
Covers, Steam Vat	.30(c)(3)	
Dockboards, Bridge Plates	.30(a)	
Dockboards, Portable	.30(a)(2)	
Dockboards, Powered	.30(a)(1) & (a)(3)	
Forging Machines	.218	
	.30(b)	
Handholds	.30(a)(4)	
Large Steam Vats	.30(c)(2)	
Veneer Machinery	.30(c)(1)	
Work Platforms, Mobile	.29(e)	
Work Platforms, Vehicle Mounted	.67	
Work Practices, Asbestos	.93a(c)(2)	
Wringers	.213(g)	
	.264(a)(5)	
	.264(c)(1)(iv)	
X-Rays	.96	